EXPLORATION OF UNORTHODOX TUNINGS AND MUSCLE MEMORY PRACTICE FOR THE ELECTRIC GUITAR

LEE ANTHONY JONES

SCHOOL OF ARTS AND MEDIA

SALFORD MUSIC RESEARCH CENTRE

UNIVERSITY OF SALFORD

SALFORD, UK

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Glossary of Terms

Alternate tuning – open, regular, instrumental and special.

Alternate picking – a style of picking based on an even up and downstroke motion.

Bridge – a device which stabilises the guitar strings.

DADGAD – a popular alternate guitar tuning, the strings read as 'DADGAD' low to high.

Declarative memory / Explicit memory – a type of conscious memory based on the recollection of specific factual information.

Double stop / Triple stop – the playing of two or three notes together respectively.

Dyad – two musical notes that imply a particular harmony.

Fretboard – a long strip of thin wood on top of the guitar neck which the frets are placed on top of. Usually made of either mahogany, rosewood or ebony.

Graphical score – a style of scoring using personalised visual symbols popularised in the 1950s by composers such as John Cage, Karlheinz Stockhausen, Earle Browne and Morton Feldman.

Guitarism – a musical inflection that reflects the idiosyncrasies of the guitar.

Inharmonicity – refers to the specific series of overtones that occur from a particular note, such as that of a vibrating guitar string.

Intonation – the precision by which musical pitch is executed on the guitar.

Lick – a stock musical phrase often used in a variety of contexts.

Muscle memory – an automated body movement that is derived from repetition.

Nut – a strip of hard material situated between the guitar head and fretboard which has grooves which the strings pass through, supporting precise string positioning.

Voicing – the specific configuration of musical notes in a chord.

Prescriptive scoring – a style of musical notation giving specific instructions or dictating a sound to be reproduced by the performer.

Procedural memory / Implicit memory – a type of long-term memory which governs use of motor skills in executing automated tasks.

Descriptive scoring – a style of scoring which focuses on providing a visual representation of the recording, such as a transcription.

Oscilliograph – a device used to record oscillating movements, in particular an electric current.

Pick/Plectrum – a small triangular tool used for picking guitar strings, usually plastic.

Semi-solid guitar – also known as a semi-hollow body guitar, is a hybrid of a hollow electric guitar with a solid block of mahogany through the centre. It combines the resonance of a hollow-body with the sustain of a solid guitar, making it highly versatile.

Slide – A glass or metal tube placed on the guitarists finger used to slide up and down the guitar fretboard. This style of playing is known as **slide guitar.**

String gauge – the thickness of a string, usually referred to as part of a set (e.g. 10-46 means .010-.046 inch thickness from high to low).

String type – the material and construction of a guitar string, again usually as part of a set. There are several types.

Sweep Picking – the action of picking through several strings in one consistent motion.

Tablature – a numerical system of notating music for stringed instruments

Triad – three musical notes together that imply a musical harmony.

Tri-sound switch – a specialised three-way switch that allows humbucker guitar pick-ups to be configured in several ways, including coil-tapping (isolating one of the pick-ups for a different sound).

Hammer-on – a technique which involves playing the fretted note and then later adding another finger onto the same string.

Bend – a technique involving playing the note and then bending the string, thus raising the pitch.

Vibrato – a technique used to sustain a note using a gentle shaking movement. This can come from either the fretting hand finger side to side or wrist.

Rake – a technique of playing through the strings while muting with the left hand to create a percussive effect.

Scordatura – a method of changing the tuning of a stringed instrument for musical effect.

Slack-Key – a style of guitar playing developed in Hawaii in the early nineteenth century characterised by its use of open tunings and fingerstyle technique.

Standard tuning – on the guitar, this is EADGBE low to high.

Tapping (Finger tapping) – a technique involving playing the fretted note and tapping with fingers of the right hand onto the same string.

Tremolo – a technique involving a fast, rapid alternate picking of the guitar string(s).

Trill – a technique involving playing the fretted note and using hammer-ons and pull-offs to alternate quickly between two given notes.

Volume swell – using the volume control or a volume pedal to increase and decrease the note creating a crescendo/dimuendo effect. It can also be applied to chords and occur slowly or rapidly.

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Abstract

The following body of research focuses on addressing the use of alternate tunings and muscle memory practice for the electric guitar. An over-reliance on existing muscle memory is commonplace among guitarists and this is often seen as a catalyst by the player to seek out new material using different fretboard patterns and shapes . While this can be effective, it is crucial to realise that often it is the *sounds* generated by the muscle memory the player wishes to change, not the muscle memory itself. After all, muscle memory provides enormous technical advantages for the guitarist, such as facilitating the execution of fast single note passages or being able to draw upon a range of chord voicings with ease.

My research will demonstrate that by changing the tuning, *not* the muscle memory information, the player can in fact retain existing muscle memory while at the same time completely changing the harmonic, melodic and timbral implications of the sounds they are generating. Changing the tuning also causes the player to develop new muscle memory shapes and patterns in line with their own musical aesthetics. Indeed, should the player find themselves in the same situation with another tuning, there are virtually an infinite amount of alternatives they can try, each tuning being completely unique.

This portfolio also addresses issues surrounding notation for the guitar in relation to the use of alternate tunings and muscle memory. I will evaluate different notational methods that emphasise prescriptive and descriptive aspects and assess the most suitable methods for my own research.

The purpose of this research is:

(I) Create new harmonies, sounds and timbres that can be derived from unorthodox alternate tunings

(II) Examine the effects changing a tuning has on the application of muscle memory for guitarists

(III) Develop an appropriate method of notation for the above

My portfolio of recordings is comprised of three sections:

(I) A series of solo studies (track 1, disc 1)

(II) Early experimental improvisations (tracks 2-7, disc 1)

(III) A set of developed improvisations culminating in a summative improvisation for twelve guitars (tracks 1-7, disc 2).

Chapter 1 - Introduction

Having taken blues and rock guitar lessons several years before being introduced to jazz; I developed a great love for guitar playing that embraces the technical nuances of the instrument such as slides, hammer-ons, string bends, vibrato, trills, finger tapping and tremolo among many other techniques (see glossary of terms). Though my fascination with this aspect of the guitar has not always found favour among some jazz lecturers. I was advised to "weed out the guitarisms" and focus more on the execution of bebop vocabulary in my first year of music college, a comment I later found from observing other students reflected a broader institutional practice in jazz whereby the guitar is encouraged to emulate the effects of a horn player and focus on the consistency of note articulation, generally avoiding the use of inflections or licks. This position is reinforced in sources such as Matt Warnock's website article *Jazz Guitar Corner: How to Swing Guitar Scales Like a Horn Player* (2013), Chris Taylor's article in Guitar Player magazine *Horn-Like Phrasing for Guitar* (2012) in addition to online forums such as www.jazzguitar.be.

My own Conservatoire classes emphasised this same style of consistent, bell-like note execution derived from horn players. While there is a technique advantage to this (e.g. allowing a more fluent execution of single lines), I disagreed with the discouragement of using such guitar nuances as I felt this was contradicted by many great jazz guitarists who historically have incorporated instrument-specific techniques in their own playing. I also believe that the nuances of any guitarist are the basis of their identity. This is certainly evident in jazz guitar through the likes of Barney Kessel's sweep picking technique, Wes Montgomery's innovative use of the thumb and octave playing, George Benson's use of octave-fifth and octave-fourth licks and Bill Frisell's use of open guitar strings which are central to how these guitarists have cultivated their musical sound.

There are also numerous jazz compositions that have traversed stylistic boundaries among guitarists, resulting in players from outside of jazz covering standards in their own inimitable style, introducing their own "guitarisms" in the process. Examples include Chet Atkins' album *Jazz from the Hills* (1994), Danny Gatton's arrangement of

Harlem Nocturne popularised by Duke Ellington on *Cruisin' Deuces* (1993) and Jeff Beck's unique arrangement of Charles Mingus' *Goodbye Porkpie Hat* from his 1976 album *Wired.*

I therefore chose to undertake this body of research partly in reaction to my own Conservatoire experience. While hugely beneficial in terms of learning jazz harmony, repertoire and gaining practical experience, there was a very clear expectation that existed of guitarists to adopt a certain sound, instrument set-up and technique I still see today.

Since graduating from the jazz course, I have continued to experiment with ways to try and develop my own voice on the guitar. In 2012, I began composing with alternate guitar tunings, the most common of these being DADGAD (low to high). As I explored these new sounds further, I came across an enormous variety of other tunings as well as some much less common variations. This discovery provided the basis for my research presented in this thesis.

My recorded portfolio will demonstrate the variety of sounds which can be generated from these more unorthodox tunings. This is supported by additional scored material in the appendices which demonstrates specific muscle memory shapes used within the tunings (giving examples) alongside a series of scores for each piece.

In chapter 2, I present my literature review which categorises the sources according to subject theme, beginning with an introduction into what the core debates are for each topic, followed by the main body of research and a summary of my findings after each section outlining where I found gaps within the existing knowledge base. There are three themes:

(I) **Alternate tunings:** from early examples of guitar scordatura in the Renaissance and Baroque periods through to Hawaiian slack-key and early blues guitar of the 19th and 20th centuries. I also explore the more recent resurgence of alternate tunings since the folk and blues revival of the 1960s in addition to guitar method sources on alternate tunings and sources

which address how they these tunings can be accessed through music technology.

(II) **Muscle memory practice in guitar:** this is focused on the question of whether a dependence on muscle memory technique is an advantage or hindrance for improvising guitarists. I examine sources which support this practice and those which take a more critical view (see **2.2**).

(III) **Notation methods:** These sources are categorised into those which advocate the use of notation in a prescriptive manner as well as those which present the score as a descriptive transcription or combination of both (see **2.3**).

In chapter 3, I identify explicit gaps in the existing knowledge field and explain how my research will address these areas (the various tunings are detailed in **Figure 1** in chapter 3). In chapter 4, I provide a commentary of my practice-based work, outlining the various stages I went through and issues I encountered along the way. I also explore various different guitar string gauges and types as part of this investigation. In chapter 5, I offer my conclusion and suggestions for further research, where I submit where and how I believe this body of research makes a contribution to new knowledge.

Chapter 2: Literature Review

This chapter will evaluate sources pertaining to the following themes:

2.1 Alternate Tunings:

- Why has standard tuning developed the way in which has today?
- Why are alternate tunings a minority interest?
- How does standard tuning for the guitar compare with other instruments?
- What historical links are there (if any) between the various different applications of alternate tunings?
- What new harmonies, timbres and textures have been previously explored through alternate tunings?
- Are there any alternate tunings not being addressed by the existing research and if so, what are they and why?

2.2 Muscle memory practice in guitar:

- What is muscle memory?
- What role does muscle memory play for guitarists?
- How do we acquire muscle memory technique?
- What are the advantages and disadvantages of muscle memory use?
- What alternative approaches exist to muscle memory for guitarists?
- What impact does the exploration of alternate guitar tunings have on muscle memory dependence?

2.3 Notation methods:

- What are prescriptive and descriptive methods of notation?
- What role does the oral music tradition play in learning alternate tunings?
- How has guitar notation and tablature been used to notate alternate tunings and muscle memory information?
- What technological methods have been used to produce notation for the guitar?
- What should the role of musical notation be in my own work?

For each of the above themes I have presented the literature review in three sub-sections:

(I) An introduction to the literature topic covering the core debates

(II) The main body of sources

(III) A summary of my findings, highlighting where I found gaps in the existing material

Due to the lack of more traditional academic literature, many of the sources I have consulted in this chapter comprise online articles, websites, recordings and interviews with guitarists.

2.1 Alternate Tunings

(I) Introduction:

Ostensibly, there seems to be very few authoritative sources which address alternate tunings for the guitar. In considering why this is the case, I found it more fruitful to first examine the arguments in support of standard tuning.

Standard tuning is almost as well established as the guitar itself going back to the sixteenth century and was developed to balance the maximum playability of scales and chords while minimising hand movements. This is discussed in Tyler and Sparks' *The Guitar and Its Music: From the Renaissance to the Classical Era* (2007) and *The Cambridge Companion to the Guitar* edited by Victor Anand Coelho (2003). Jeff Owens' article for the Fender Guitars website entitled *Standard Tuning: How EADGBE Came to Be* (Date Unknown) and Paul Guy's website article *A Brief History of the Guitar* (2007) also both address this.

Standard tuning (EADGBE low to high) is similar to preceding instruments such as the oud and lute, both tuned in fourths with one exception between two of the strings/courses (a pair of strings tuned to the same note or octaves). It also serves as an important frame of reference for guitarists and bassists in discussing topics that relate to the fretboard, such as repertoire, finger positions, chord shapes, licks and exercises. This frame of reference is especially true among guitarists who do not read

music or have limited theoretical knowledge. Some of the best examples of this are illustrated in the variety of popular guitar magazine publications such as *Guitar Player*, *Guitar Techniques*, *Guitarist* and *Total Guitar* which usually contain tablature, notation and fingering information for all lesson material, catering to guitarists of different abilities.

Given the reliance on standard tuning among guitarists, it is reasonable that there is some trepidation towards experimentation with alternate tunings. After all, this practice challenges all familiarity a guitarist associates with existing muscle memory material. This issue is highlighted in Jude Gold's article *Beginner: Jimmy Page's Mesmerizing Open Tunings* (2008) from *Guitar Player* magazine where Gold argues most young rock guitarists are so fixated on learning their instrument, they neglect the possibilities of exploring open tunings like DADGAD, fearing it will cause them to somehow lose what they have previously learnt in standard tuning. Gold presents Led Zeppelin's *Kashmir* as an example of a creative work derived from the exploration of DADGAD tuning.

The more recent standardisation of guitar education through conservatoires is also significant to this debate, something I have experienced first-hand. Within a jazz context, the guitar typically serves as an accompanying instrument to the frontline horn or vocalist, drawing on chord voicings and timbres which are synonymous with standard tuning. In my own experience, I have often found this to be coupled with a standardised approach to technique, focusing on making the guitar sound more like a horn and avoiding any use of instrumental inflections (as I discussed on p. 1).

My research will highlight the potential for greater experimentation with alternate guitar tunings and instrumental inflections.

The following sources will discuss the development of alternate guitar tunings chronologically, beginning with scordatura used in the sixteenth to eighteenth centuries. I will then explore the Hawaiian slack-key guitar of the early nineteenth century, which is followed by sources which discuss early twentieth century blues guitarists. I will then address the resurgence of alternate guitar tunings from the 1960s folk and blues revival onwards, including popular singer-songwriters in addition to jazz,

rock and modern acoustic guitarists. I will compare the various approaches collectively and in relation to my own work.

I will then explore guitar method sources which address alternate tunings and finally, sources which discuss technological methods for accessing alternate tunings as a basis for comparison with the more traditional approach. I will conclude with a summary of my findings, highlighting potential gaps within the knowledge base.

(II) Literature Review:

The following sources provide some historical context for my own research into alternate tunings. The earliest known example of this practice is called scordatura.

The practice of tuning in fourths with a major third exception can be traced back to the development of the early Renaissance guitar, which used four courses (pairs of strings, sometimes separated by an octave). This is documented in Michael Fink's essay *Stringing and Tuning the Renaissance Four-Course Guitar: Interpreting the Primary Sources* (2007) (p. 4-5).

However, standard tuning as we know it today was not yet evident at this stage. During the baroque period (1600-1750), the guitar developed into a five course instrument with a more standardised tuning of A-D-G-B-E low to high. However, variations on this tuning were commonplace in scordatura and James Tyler's book *The Early Guitar: A History and Handbook* (1980) details a list of seventeenth century guitar tunings (p. 184-186)

Boyden et al. also give several guitar scordatura examples in the *Oxford Music Online* (2001). These include *Iquarto Libri Deila Chitarra Spagnola* by Foscarini (c1632), *Varii Capricci* by Corbetta (1643), *Soavi Concerti* by Granata (1659), *Sonate Nuove* by Bottazzari (1663), *Musicalische Gemiiths—Ergötzung* by Jakob Kremberg (1689) which used up to six tunings and *Nouvelles Découvertes Sur la Guitarre* by François Campion (1705) which used up to seven.

The baroque era represented the height of popularity for scordatura before its demise. Boyden et al. argue guitar scordatura was closely associated with that of the lute, both

using tablature as a basis for notation. However, after the development of the classical guitar from the mid-eighteenth century onwards (now transitioning from five courses to six strings), the guitar began using standard notation. Boyden et al. speculate this may be a reason for the demise of scordatura, despite continued limited use of violin scordatura for timbral effect by composers in the eighteenth and nineteenth centuries. While guitar scordatura has remained a niche interest since this demise, the practice is still documented. Classical guitarist Lobito Grenzenlos' book *Scordatura* (2017) contains a series of his own arrangements in this style.

From the 1830s, there was a new significant historical development which originated from Hawaii called slack-key guitar which used its own adaptation of alternate tunings. Unlike scordatura which was notated, this music was learnt orally and still is today. Interestingly, from my findings I have found no source which definitively links classical guitar scordatura and Hawaiian slack-key guitar. The geographical differences, a near century-long gap and such a contrast in the approach to musical notation might suggest no explicit link. However, it may be reasonable to speculate the expanding Honolulu harbour (which was later declared Hawaii's capital city in 1850) could have had been subject to numerous musical influences from around the world. Classical guitar technique and slack-key also both use similar fingerstyle techniques.

Kevin Ransom's piece from Guitar Player magazine, *Modern Hawaiian Slack-Key Masters* (1994), claims the open strings are typically slackened to an open G chord or a tuning with a major seventh or major sixth. Up until mid-1940s, slack-key guitar was almost exclusively used to accompany vocals though more recently can also involve multiple guitars in different tunings playing together. Popular slack-key tunings include open G (known as 'taro patch') and 'CWahine' (CGDGBE), 'GWahine' (DGDF#BD) and 'GMauna Loa' (DGDDGD)". Ransom discusses the influence of slack-key guitar on American guitarists such as Chet Atkins who visited Hawaii and later made a recording showcasing his own version of the style, entitled *Hawaiian Slack Key* from his 1973 album *Alone.*

There is seemingly very little literature which addresses the musical lineage between Hawaiian slack-key guitar and the early twentieth century blues slide guitarists of the

American South (which incorporated many open tunings and techniques of Hawaiian slack-key). Delta blues guitarists of the early twentieth century including Robert Johnson, Skip James and Son House were known for using similar open guitar tunings such as open E, G and D. Examples include Johnson's *Crossroad Blues* (1936), *My Black Mamma – Part II* (1930) by Son House and *Hard Time Killing Floor Blues* (1931) by Skip James. More recent American exponents of this style include Bonnie Raitt, Ry Cooder and Sonny Landreth.

This debate is explored further by John W. Troutman in his essay *Steelin' the Slide: Hawai'i and the Birth of the Blues Guitar* (2013) where he discusses the link between the slide guitar style developed in the early twentieth century by African American musicians and Hawaii. Troutman contends that contrary to popular belief that blues slide guitar had African-based origins from the monochord zither, this was in fact inaccurate:

> No monochord zithers seem to appear in the written record before the 1930s, well after African Americans had begun recording their slide guitars. This study will reveal that what we instead find in the South, in great preponderance, are Hawaiian guitars. Everywhere. Native Hawaiian guitarists, who slid metal bars over their strings to create sweeping glissando sounds, inundated the South in the first decades of the twentieth century. Yet, in the obsessively researched field of blues music, none yet have seen fit to consider the Native Hawaiian influence as anything more than a curiosity, a sideshow unworthy of serious contemplation.

These types of open tunings were explored further in the 1960s during the folk and blues revival and were later proceeded by more experimental open tunings by the likes of artists such as Joni Mitchell.

Colin Harper's book *Dazzling Stranger Bert Jansch and the British Folk and Blues Revival* (2006) examines the development of DADGAD during this time, a tuning which has significantly influenced my own work. Harper makes a number of points around DADGAD tuning and its pioneer Davy Graham, who discovered it could also work well for playing both Moroccan and traditional Irish repertoire (p. 3). Harper claims the first

recorded DADGAD example was Graham's piece *She Moved through the Fair* (1963). Harper also discusses Martin Carthy's development of his own tuning CGCDGA (p. 88), suggesting both he and Graham influenced each other in this process (p. 88).

Harper identifies a link between the 1960s British folk and blues scene and jazz, discussing Jansch's collaborations with jazz guitarist Gary Boyle and Charles Mingus' drummer Dannie Richmond who appeared on Jansch's *Moonshine* (1973) (p. 242).

Alternate tunings also extended to jazz guitar. In 1964, Jazz guitarist Ralph Patt began exploring major thirds tuning, often favouring seven and eight string guitars to compensate for the limited range due to the closer intervals between the strings. Patt's interests were largely in twelve-tone music, having studied with Gunther Schuller and contributed to George Russell's seminal text *Lydian Chromatic Concept of Tonal Organisation* 1953. Patt offers further discussion on his website where he claims to have used the tuning in his later commercial studio work.

More recently, composers have taken more experimental approaches to alternate tunings, focusing on their use primarily as a means to create new sounds and textures, congruent with my own approach. This has led to a number of innovative applications of different alternate tunings. In Andy Ellis' article for Guitar Player, *Hexagrams of the Heavens: Exploring Joni's Alternate Tunings* (1995) he discusses with Martin Simpson eight of Joni Mitchell's songs which use a variety of open tunings.

Ellis and Simpson demonstrate a chord progression reminiscent of Mitchell's famous *Big Yellow Taxi* (1970) using: D, G sus2 and Asus 4 (where the fourth is in fact doubled creating an extra jangly effect). Simpson plays the reoccurrence of chord I at the eighth position for extra variety and colour. The second example analyses Mitchell's use of open G: DGDGBD which occupies a similar register to open D. Mitchell's later tunings were lower to accommodate her deepening vocal range (*Amelia,* for instance, in open C). This near baritone range resulted in their being no bass on the original recording.

Ellis and Simpson also discuss Mitchell's short-hand approach to cataloguing different tunings by writing down the lowest pitch of the tuning, followed by the fret number

that corresponds to the higher string below. For example, standard tuning would be: E – 5 – 5 – 5 – 4 – 5 and the tuning for *Coyote* would be C – 7 – 7 – 3 – 7 – 4.

Other examples include Martin Simpson's work, documented in various articles from Guitar Player magazine, including: *Expanding Open Tunings* (1995); where Simpson explains his development of a new Bbsus2 tuning he developed on a piece entitled 'Raglan Road' and *DADGAD for Dummies* (2000); where Simpson demonstrates a series of his own playing examples. Simpson uses a modified set of gauge 13 flat top strings, low to high: .056, .045, .035, .026, .015 and .013. I will be exploring different string gauges used by guitarists throughout this chapter and in my commentary in chapter 4.

Ellis also interviews Laurence Juber for *Guitar Player* Magazine in his article *Discover DADGAD: Laurence Juber Reveals the Secrets of this Enchanted Open Tuning* (2004). Juber argues that DADGAD facilitates interesting chord voicings which contain a combination of fretted notes and open strings. For example, a scale run that includes the major third, fourth and fifth of the chord ringing together against each other.

Juber demonstrates the practical advantages of DADGAD, such as the greater accessibility of playing octaves and colour tones (e.g. 2nds, 4ths, 6ths) "without any finger gymnastics". Juber explores playing in the key of A within DADGAD as well as D major and minor. Juber's final examples explore how DADGAD can be applied to different styles. Juber demonstrates a series of close, cluster voicings over a D pedal which he says remind him of McCoy Tyner's chords. Juber also shows how DADGAD can create both dissonant and consonant sounding chords, referring to his arrangement of The Beatles' *Strawberry Fields Forever* as a good example of the latter. Finally, Juber demonstrates some modal scalic runs around D dorian and mixolydian, showing how he can blend the two enigmatically as the major/minor centre has been suspended. To conclude, Juber shows how familiar fingering patterns from a standard-tuned blues can be used in DADGAD to create a whole new sound. Juber uses GHS Bronze strings, low to high: .056, .042, .032, .024, .017 and .013.

Teja Gerken's article from Guitar Player magazine *The Journeyman: Laurence Juber on Arranging in DADGAD, Being a First Call Session Player and his Latest Album,*

Fingerboard Road (2015) also highlights Juber's repertoire of DADGAD repertoire, including covers by Henry Macini and arrangements of *Peg* by Steely Dan, *Won't Get Fooled Again* by The Who, *Sittin' on a Dock on a Bay* by Otis Redding and *Georgia on My Mind* by Hoagy Carmichael. Juber discusses the accessibility DADGAD provides to create rich jazz harmonies, such as the 7#9#5 chord in his arrangement of *Peg* by Steely Dan. Juber also mentions the wide range of keys he writes in which is a practice not normally associated with other DADGAD guitarists (e.g. Bb, Gm and F).

Recently, jazz-fusion guitarists Pat Metheny and Frank Gambale have adopted variations of Nashville tuning into their own work. Traditionally, Nashville involves replacing the lower four strings of a standard guitar and transposing them up one octave to create a pseudo-mandolin effect. Often, recording engineers will use this sound to reinforce a standard-tuned guitar and create a more colourful sonic texture. Recorded examples include Keith Richards' work on the Rolling Stones' *You Can't Always Get What You Want* from the album *Let It Bleed* (1969) and Tom Petty's *Free Fallin'* from the album *Full Moon Fever* (1989).

In his September 2012 video interview with the Italian guitar magazine *Chitarre*, Gambale showcases his trademark *Gambale tuning*, derived from Nashville tuning. However, Gambale's desire for a "fundamental guitar" that would incorporate lower registers too led him to develop his own variation through by reversing this idea. Therefore, the bottom four strings remain as normal and the top two are transposed an octave lower. Gambale states though: "It sounded like a baritone guitar to me, too low, I couldn't really get the mid-range chord pitches where I liked them...". To counteract this, Gambale claims he transposed the entire tuning up a fourth, resulting in Nashville tuning a fifth lower.

Pat Metheny's release *One Quiet Night* (2003) for solo baritone guitar uses half-Nashville tuning. In the album liner notes, Metheny explains that whereas Nashville tuning transposes the octave of the four lowest strings up an octave, his own adaptation of baritone tuning transposes the whole guitar down a fifth to ADGCEA respectively, using a set of baritone strings. However, Metheny then substitutes the

third and fourth strings for a standard gauge which are tuned an octave higher relative to the tuning.

The guitar uses a longer scale length to accommodate for these changes. Although I could not find the exact gauges Metheny used for the record, 0.16-0.70 phosphor bronze wound strings are a standard choice for acoustic baritone guitar (though in Metheny's case the third and fourth strings are an octave higher, almost certainly affecting the gauge choice).

Guitarist Stanley Jordan is known for his unorthodox finger tapping technique and pioneering use of all fourths guitar tuning, a regular tuning derived from standard tuning by avoiding the major third interval between the second and third strings. This produces EADGCF low to high.

In the youtube video *Stanley Jordan on P4 Tuning* posted by Ohad Aloni (2013), Jordan argues: "There's a one-to-one correspondence between the structure physically and visually and the pitch structure so it's real easy I can transpose it, it's all basically the same." Jordan argues all fourths tuning is more logical as it makes transposing chord shapes between the different strings much easier as the player only has to memorise one shape. In standard tuning, this would not be possible due to the major third interval that occurs between the open third and second strings. Whereas Gambale's example is focused on achieving a desired audible effect, Jordan's choice of tuning appears more concerned with playability. I think this distinction is representative of a broader method for categorising how alternate tunings are used by guitarists across all musical genres.

There are a number of modern rock guitar examples of alternate tunings. For instance, in his interview with Max Frank for the website geargods.net, *Robert Fripp Discusses New Standard Tuning* (2015), Fripp discusses his development of 'New Standard Tuning' ('NST') based on all fifths. Fripp has used the NST widely since 1985. Fripp's musical releases with his band and teaching school, 'The League of Crafty Guitarists', include: *Live* (1986)*, Live II* (1991), *Show of Hands* (1991) and *Intergalactic Boogie Express - Live in Europe 1991* (1995). Frank includes a video clip where Fripp briefly

discusses readapting his live performances with King Crimson using New Standard tuning.

More common examples of rock guitar adopting alternate tunings (usually involving standard tuning dropped entirely or a variant) can be seen in the dropped low string tunings used by the likes of Steve Vai, Jimi Hendrix, Nirvana, Nine Inch Nails and Linkin Park. However, some of these applications of tunings could be questioned given their closer proximity to standard tuning. In fact, Jude Gold's short article for Guitar Player magazine, *A Perspective on DADGAD* (2008), queries whether DADGAD tuning can actually be considered a legitimate alternate tuning given its popularity among guitarists, citing its wide use by guitarists like Jimmy Page from Led Zeppelin.

Since the folk and blues revival discussed earlier, alternate tunings have become more commonplace among popular singer-songwriters such as Newton Faulkner as well a more virtuosic group of acoustic guitarists such as Michael Hedges, Jon Gomm, Thomas Leeb, Eric Roche and Antonio Forcione who have all covered popular music repertoire in their own style and tunings. For instance, Roche's cover of 'Jump' by Van Halen from his album *With These Hands* (2004), Forcione's cover of 'I Heard It Through the Grapevine' from *Live!* (2000) and Gomm's cover of Radiohead's 'High and Dry' from his album *Hypertension* (2003).

The following sources explore guitar method books which address alternate tunings. William Sethares' ebook *The Alternate Tuning Guide* (2011) comprehensively reviews most of the established alternate tunings in addition to some more obscure examples. He begins by arguing the advantages of exploring alternate tunings and why these are not more commonly used among guitarists, due to the practicalities of implementing them (p. 1).

Sethares categorises his exploration of alternate tunings into four broad categories: open (tuned to an open chord), instrumental (based on another instrument's tuning), regular (consistent intervals between strings) and special (a miscellaneous collection usually associated with singer songwriters). Occasionally, there is some crossover between these categories. For instance, Sethares' analysis of Dobro tuning (a tuning

associated with the popular metal-made guitar from the 1920s fitted with a resonator speaker) is both a type of open *and* instrumental tuning (GBDGBD), (p. 44).

Sethares does not address chromatic, regular minor/major 2^{nd} or 7^{th} tunings, though does make reference to the relatively uncommon "trivial" tuning (p. 60), which comprises of regular octaves/unisons (e.g. CCCCCC). Unison tuning already has some establishment in rock guitar, having been pioneered by Lou Reed from The Velvet Underground and dubbed 'Ostrich tuning' because of its use on the song *The Ostrich* (1964) by Reed's former band The Primitives.

Guitar instruction books which teach more modern alternate tunings include *The Complete Book of Alternate Tunings* by Mark Hanson (1995) and *Alternate Tuning Chord Dictionary* by Chad Johnson (2002). Hanson's book, despite its title, is focused mainly on open tunings. Beginning with standard (EADGBE) and then moving through a range of open tunings categorised into the keys of D, G and C which gradually increase in complexity. However, unlike traditional scordatura which notates prescriptively where to play the notes on the guitar, Hanson notates the actual sounds which make the exercises very difficult to play without consulting the tablature (perhaps with exception to drop D: DADGBE, which can be worked out). He concludes with a look into Hawaiian slack-key tunings and provides a reference list of songs and their respective tunings near the end, along with a mini chord dictionary section. Johnson's book however, is more of an extended chord dictionary focused on open and dropped tunings.

Alternate guitar tunings can also be achieved or simulated through technology both manually and artificially. The article *Timara String Drop for Alternate Tunings: Dillon Guitar* from Music Trades Magazine [Author Unknown] (2007) discusses a lever-type device which allows the player to manually instant-tune the low E (or any string placed on) down in pitch. The sound of the string dropping is also very significant this article claims: "Its extender handle allows the player to manage the speed of the drop; the string can be dropped slowly, so that the bend sound is audible rather than just dropped instantly". The article also states that no modification to the guitar is required, unlike competing products on the market.

Mark Davis' article from Guitar Player magazine, *Fret-King Super-Matic Self-Tuning Guitar* (2011) discusses the features of the Fret-King Supermatic self-tuning guitar which includes a Wilkinson self-tuning bridge. The super-matic can switch from standard E tuning to open G, DADGAD, or open D in a matter of seconds. There is also a built in chromatic tuner and hi-visibility display so the player can see what tuning they are in and check tuning of individual strings. The bridge can also be used by the player to create five personalised tunings of their own choice.

In his interview with Guitar Player magazine's Brett Ratner, *Performance Notes: Alternate Tunings Onstage* (1998) slide guitarist Sonny Landreth discusses using a wide variety of up to ten different tunings in a performance. He minimises changing guitars by using a modified Hipshot Triology Multiple Tuning bridge, designed for telecaster and Stratocaster guitars. Landreth comments: "It's great for sessions, or when you have to fly without a backline full of guitars". Landreth recommends drop D tuning as a good place to start for beginners who are unsure about abandoning the comfort of standard tuning as it only involves detuning the low string done a tone.

Craig Anerton's article for Guitar Player magazine, *The Alternative to Alternate Tunings* (2012), examines four technology-based options for making alternate tunings more accessible for the performing guitarist:

Firstly, the MIDI guitar which generates MIDI data which drives a synthesizer. Each guitar string is also linked to its own channel, meaning each string can be programmed to an individual transposition and sound patch. Anerton argues you can transpose by a vast range and can assign different sounds to each string but tracking and latency problems can be a hindrance. The correlation between what the guitarist plays and hears is also completely different.

Next, Anerton discusses the Gibson Robot/Wilkinson ATD, a limited edition range of modified Gibson guitars which automatically tune themselves to a set tuning as prescribed by the player. The Wilkinson ATD self-tuning bridge can be used to modify other guitars to have the same facility. Pros of this method according to Anerton are it is a huge time saver, there is no disconnect between what the guitarist plays and

hears, no alteration to tonal quality and physically tuning the strings down makes them easier to bend. Limitations however include not being able to tune beyond the realistic range of a guitar and it takes at least five seconds to move between tunings, which can be problematic in a performance situation.

Modeled Transposition is a method which uses digital signal processing to model the sound of a transposed guitar string for each actual string played. Anerton claims this is advantageous for reaching beyond the normal range of the strings and changing tunings if immediate. However, there is an inevitable disparity between the notes played and the respective pitches generated. Sound quality also deteriorates with more extreme transpositions.

Anerton's final suggestion is more of a studio recording technique than a practical live performance solution. On guitars with a separate audio output for each string, Anerton argues it is possible to record them into separate tracks in a DAW (digital audio workstation such as Logic, Protools, Cubase, etc). Then, the DAW can be used to transpose the recorded sound in non-real time (or a transposition plug-in). The pros of this method are in the studio method used, meaning high sound quality as the transposition occurs in non-real time, meaning it can also go beyond the normal range of the guitar strings without compromise. This studio method also means the recorded sounds can later be mixed with varying FXs. Obviously though, this technique cannot be used live and it is not possible to hear what the end result will be like until the original part has been recorded and processed.

(III) Summary of Findings:

Alternate tunings are a rich compositional resource and favoured by guitarists across most genres including classical, folk, blues, slide, Hawaiian, jazz fusion, rock and pop. Alternate tunings therefore be readily adapted by players with a variety of stylistic interests, technical skill and musical intentions. Alternate tunings are also a continually expansive area relatively unexplored by the general guitar community, especially for the electric guitar.

However, the existing literature does not explore alternate tunings with more dissonant string intervals, which is where I believe my work contributes to new knowledge. In some cases, as argued by Sethares, this is through reasons of practicality implementing them. From my findings though I would also suggest popular and roots music guitarists (within folk and blues for instance) are aesthetically drawn to more consonant harmonic sounds, such as that of open tunings. It is certainly evident from my own recording work (see chapter 4 and the appendices) that the exploration of more unorthodox alternate tunings offer a variety of contrasting timbres and harmonies that the other more common alternate tunings do not.

The existing literature does not provide much discourse around how different alternate tunings relate to different choices of string gauge/type either. According to my findings, most guitarists work with an established string set they like and continue to use it. Though it is beyond the remit of this PhD to explore the psychoacoustic nature of every type of string type and alternate tuning, my portfolio incorporates a cross-section of string gauges and types as a basis for comparison.

The existing literature does not discuss the potential impact of a guitarist's ability to control intonation effectively. I have found this is particularly relevant when slackening the bass string which requires a lighter touch and even to be slightly flattened in pitch to maintain intonational accuracy. The existing literature also focuses primarily on the acoustic guitar and not the electric, quite likely due to its strong folk and blues roots, favoured by fingerstyle guitarists.

There is also a lack of literature which looks at the development of alternate tunings from a historical perspective or that even attempts to make any evidential links between the use of alternate tunings in different contexts. On this basis, I believe my research could contribute to presenting new knowledge.

A further observation from the existing literature I made is the near century long gap between late guitar scordatura pieces of the eighteenth century and subsequent applications of alternate tunings. Though I could not find a definitive explanation for this, Boyden et al. suggest the standardisation of the guitar was key to this:

> With the emergence of the new guitar, tablature was abandoned in favour of staff notation, which made reading and playing scordaturas difficult, and might explain the subsequent decline of unusual tunings for the instrument, except for music grounded in aural tradition.

It is perhaps no surprise then that more contemporary applications of alternate tunings from the nineteenth century to the present day tend to have been within oral music traditions such as Hawaiian slack-key, early blues guitar and experimentation by folk singer-songwriters. The absence of material using conventional music notation for alternate tunings could also be a reason why there is such minimal scholarly material on this subject. However, more recently guitar tuition magazines and textbooks have attempted to address alternate tunings more widely. Given the growing establishment of practice-based research, it may be possible academia follows suit in the longer term. There is also a no literature than I can find which categorises the development of alternate tunings from a historical perspective (for example, scordatura, Hawaiian slack-key, early American blues guitar, the folk and blues revival and contemporary players). I would therefore submit that this is a further possible area of new knowledge creation.

2.2 Muscle memory practice in guitar

(I) Introduction:

The *Cambridge Dictionary* online (n.d.) defines "muscle memory" as: "the ability to move a part of your body without thinking about it, learned by repeating the movement many times".

There is considerable debate within the guitar community and among musicians more widely which questions whether muscle memory is in fact a creative advantage, hindrance or even a mix of both. The literature in this section will evaluate sources from several different perspectives.

As a guitarist, I have found developing muscle memory is an inevitable by-product of constant practice. While I have found this advantageous for playing technically demanding material, I have also found the repetitive nature of these physical motions

can have the potential to become predictable and musically uninspiring over time, especially when composing and improvising.

Alternate tunings can cause the same finger movements and shapes from standard tuning to sound completely different due to the resultant change of pitches, intervals and timbres between the open strings. This is especially the case with the more unorthodox tunings discussed in chapter 4. The debate around how to adapt muscle memory shapes in an alternate tuning is regularly discussed on online forums such as www.ultimate-guitar.com, www.equipboard.com, and www.music.stackexchange.com though does not appear to receive scholarly recognition from more authoritative sources.

While I have found traditional texts on the subject of music psychology which address procedural knowledge (also referred to as procedural memory, implicit memory and motor skills) which muscle memory pertains to, there seems to be little information from my findings which address the role of muscle memory from a musician's perspective, more specifically the guitar. Therefore, some of the online sources in this review relate more to guitar pedagogy.

First, I will look at sources which are favourable towards musical muscle memory use. I will then contrast these with sources which take a more moderate and finally, critical position. In each case, I will begin with the most authoritative texts supported by online sources. Again, I will conclude with a summary of my findings.

(II) Literature Review:

Authoritative texts which take a more favourable position towards music muscle memory use include David Sudnow's book, *Ways of the Hand* (1978), *Psychology for Musicians* by Andreas C Lehmann et al. (2007) and John A. Sloboda's text *Exploring The Musical Mind: Cognition, Emotion, Ability, Function* (2005).

Sudnow (1978) chronicles his development as a jazz pianist from a physiological perspective. This in itself is distinctly different to most jazz scholars who focus on more musically objective topics like jazz history, musicology and harmony.

A comparable approach to Sudnow's discussion in jazz might be the concept of swing, which I have often heard lecturers describe as very difficult to teach as it is something that draws on musical intuition and feel rather than just knowledge. Again, I have found no traditional academic texts which discuss this though online articles on wesbites such as www.jazzadvice.com provide some discourse in this area.

Sudnow's initial challenges focused on grasping chords and melody with the left hand. He discusses the transition he made from conceiving these as collections of individual notes to physical shapes or "constellations" (p. 9). Sudnow shares the challenges he faced in training his hands to move from one chord to the next, different technique approaches he employed to get around this and ways of visualising particular chord movements, focusing on the specific muscle movements between two chords (p. 11). Sudnow adds the importance of practicing such a transition at a set tempo to enhance continuity, a theme which reoccurs throughout other sources in this chapter.

Sudnow's emphasis on describing these kinetic aspects of muscle memory is markedly different from simply presenting a series of visual diagrams for the reader to interpret. This written type of description that emphasises specific physical motions is also evident in guitar magazines and educational materials such as the Rockschool graded exam repertoire books.

Sudnow discusses how these motions became more instinctive over time with practice, using a growing repertoire of jazz tunes and chord progressions (p. 14) before focusing more closely on the development of the right hand. In learning melodies and improvisation, he claims transcription and ear training began to play a larger role.

Sudnow later discusses his approach to the physiology of playing piano, citing Jimmy Rowles in particular (p. 82-83). Sudnow gives focus to the whole body experience of playing an instrument, implying that our concept of muscle memory does not just apply to the hands but also posture and physical movement generally.

Lehmann et al. (2007) explains a four stage practice method relating to the development of motor skills, based on Chaffin et al. (2002). Stage one involves reading through the material to get an overview of the relevant piece, incorporating methods

such as sight reading, analysis and listening. Stage two is where the material is broken into smaller sections and methodically pieced together later. This stage is where the motor skills become largely automatised, according to Lehmann et al. "resulting in a first incidental memorization of the piece" (p. 76). During the third stage, the piece is refined to performance standard, rooting out any technical imperfections. Lehmann et al. also explain that this stage represents an ongoing longer term process in any musician's development (p. 77). The final stage relates to maintenance work in order to accurately memorise a piece of music. During this stage there may be ongoing modifications though the main focus is "...general upkeep of the technical and memory aspects." (p. 77).

Sloboda (2005) adds credence to Lehmann et al. through presenting an important distinction between the transition of *factual* to *procedural* knowledge:

> ...skill learning involves acquiring *habits.* The principal feature of a habit is that it is *automatic,* and that it uses up little or no mental capacity to execute. The precursors of habits are conscious, deliberate, and effortful behaviours which commonly involve verbal control...skill learning involves passing from factual knowledge (knowing that) to procedural knowledge (knowing how) (p. 216).

Sloboda goes on to give further detail using Fitts' (1964) model which suggests skill acquisition can be divided into three stages: cognitive, associative and autonomous.

Less academic sources which also encourage muscle memory use include James Dean's journal article, *Pat Metheny's Finger Routes: The Role of Muscle Memory in Guitar Improvisation* from Jazz Perspectives (2014), David Motto's article *Learn Faster by Playing Slower: Muscle Memory Techniques that Work* (2010) Richard Cochrane's website article *What is Muscle Memory? (Date Unknown),* the article *Learning to Play Music: The Phenomena of Muscle Memory* (Date Unknown) by Levi for the website joytunes.com and Grace Lam's website post *Muscle Memory Musicians Secret Weapon* (2012).

Dean (2014) takes a more balanced view of muscle memory application among guitarists, examining live DVD footage of Pat Metheny's performances for transcription and analysis.

Dean highlights the issues surrounding muscle memory use citing musicologist Lars Lilliestam:

> When we learn an instrument we learn scales and chord shapes as finger routes, which are programmed into the brain and set frames for what we can play. Music that employs moments that live outside these finger routes can be hard to play and demand extra effort.

Dean argues that little is written about jazz guitar technique itself and is fairly critical of sources such as Howard Spring's analysis of Charlie Christian's solos and Rob Van Der Black's study of Wes Montgomery that neglect such information concerning muscle memory as they are derived solely from recordings rather than video footage, potentially leading to inaccurate fingering.

Dean includes both tablature *and* notation in his own musical transcriptions, concluding with a discussion of how muscle memory relates to the practice of transcribing an improvised solo:

> ...when transcribing from an audio recording only, determining exactly where a passage is played on the guitar is almost always open to interpretation (an exception...might include...an open string on the guitar which has a clear tonal characteristic...)...Additionally, a transcription which includes details of position and fingering (such as a tablature example) is in danger of presenting the preferred technique of the transcriber, rather than the player...

Dean then presents a series of Pat Metheny transcriptions from live DVD footage using a detailed mix of notation, tablature, position numbers and fingering instructions which are presented both as a series of numbers underneath the tablature well as in his own graphic charts. Dean also includes a short terminology list.

Dean shares a revealing insight from Metheny himself concerning the extent to which he believes muscle memory underpins jazz improvisation:

> ...if you play 200 nights in a row, you are not going to be playing different shit every night. You're just not. There's this mystical version of what jazz improvisation is that implies that every single time you play, that you're going to go to this far off mystical place and you're going to discover this universe...

Dean concludes that Metheny's faster musical passages tend to be underpinned by a set of muscle-memory derived patterns and other sections are based on "...well developed finger-guided phrases..."

Dean's findings demonstrate that musical muscle memory is an inevitable by-product of practice and highly effective when harnessed properly. Dean also suggests however a lack of understanding of muscle memory can affect the quality of a musical transcription and hence advocates greater musical transcription from video footage.

The online articles by Motto (2010), Levi (date unknown) and Lam (2012) all emphasise the importance of practicing very slowly to begin with so that the muscles do not learn mistakes. Students are often reluctant to adopt this approach due to the perceived notion that it will take too long, according to Motto. However, he also argues there is credence to this method, especially for learning difficult musical passages. Motto states this kind of practice should be prioritised and is more constructive as the brain and muscles learn the correct information more efficiently from the start.

Lam also emphasises the importance of ensuring that the memory information is correct during the initial learning stage as this can be difficult to correct later on and stresses the importance of having adequate goals to focus on in a musician's practice routine, emphasising the importance of being patient, diligent and consistent when learning new muscle memory skills.

Levi also makes a distinction between learning muscle memory technique, which relates to building up muscle memory through the working out process and practicing, whereby once you have it correct it can be practiced through repetition.

Levi offers several tips on improving muscle memory:

1. Practicing twice per day with short intervals between sessions
2. Practice slowly
3. Set a timer/alarm for the end of the session that is kept out of sight during practicing
4. A healthy distraction can actually be good for muscle memory practice – such as having the TV on silent or at low volume.

However, Levi cautions against introducing mistakes during the learning phase, as it can program the wrong muscle memory instructions and make it very hard and time consuming to undo.

Sources which take a more moderate position toward muscle memory use include Brian Jenkins' article *Muscle Memory is a Requirement for All Musicians* (2016). Jenkins states:

> Implicit, procedural, and non-declarative memory are all synonymous with 'muscle memory'. All of these terms refer to the long term memory that helps us perform motor skills like walking, riding a bike, or playing a musical instrument. This type of memory does *not* require conscious thought.

Jenkins argues every musician uses muscle memory (the only exception being complete beginners) which is readily acquired through ongoing practice. It is not something a musician has to try to gain, he claims. Jenkins also cautions that muscle memory has its flaws as an unplanned distraction during a performance can throw a musician off if they are solely relying on muscle memory technique. That is to say, memorising the music as a series of physical motions that the nerves controlling the muscles have become accustomed to (something I have seen guitar students do in lessons).

Jenkins does however express a positive side to muscle memory application, arguing it plays a central role in any musician's technique, giving the example of how a sight-reading musician will instinctively look for patterns of movement rather than a series

of individual notes as this allows them to execute the notated passage more effectively.

Jenkins proposes that there is a healthy medium that can be achieved by musicians when balancing muscle memory technique with "explicit memory", which is the musician's ability to consciously remember specific musical passages when the automated muscle memory fails or if they are searching for a greater sense of creative freedom in the musical performance, concluding:

> When you play with muscle memory *and* explicit memory, your body is on autopilot and you can think about the music and make changes when needed. It's a winning combination.

Cynthia Darling's article *Muscle Memory, Ear Training and Intonation* (2009) examines the affect muscle memory has on intonation. Darling discusses this with assistant music professor Charlene Dell, who describes intonation as: "...a combination of what the player hears in his head and the muscle memory he attributes to that sound." Darling deduces that intonation issues occur where there is a disconnect between what a student is hearing and the sound that the muscle memory in their fingers is producing.

Dell also discusses the importance of singing as a means of improving intonation as well as playing chord tones against the drone of the respective chord to help train the ear and thus, intonation in the process. It is important to underscore the importance of Darling's article and the wider issues that exist for guitarists. I have found intonation is rarely discussed, let alone given scholarly recognition from the perspective of the musician. Yet, it's importance cannot be understated and is something I have had to be very mindful of in my own recording and performance work both generally and in this portfolio. The amount of variables that can impact intonational accuracy are extensive and can include the slightest change of pressure applied by the fretting hand, which finger is used, how hard the note is played in addition to factors such as the condition of the strings, frets and way the guitar is set up. The aesthetic of most guitarists is to able to control these factors in such a way that every possible variable is mitigated as much as possible.

Moorman and Miner's article *Organizational Improvisation and Organizational Memory* (1998) break down organisational memory into two parts, "procedural" memory which is skill-based and "declarative" memory which is knowledge or fact-based. Moor and Miner explore a range of varying contexts that employ both of these memory types, stating that:

> "...prior knowledge and routines are important to improvisation, but that the presence of stable competencies is not inconsistent with improvising (p. 706).

Moorman and Miner discuss how the outcome of an improvisation can be influenced by prior procedural and declarative memory (see diagram on p707), while also underscoring the importance of aesthetic decisions made by the improviser. However, they also caution that a surplus of procedural or declarative knowledge does not always correspond to the best outcome. Moorman and Miner make nine propositions that address the importance of achieving an optimum balance between procedural and declarative memory when improvising (p. 709):

"Proposition 1: The greater the procedural memory level, the greater the likelihood that improvisation will produce coherent action."

"Proposition 2: The greater the procedural memory level, the greater the likelihood that improvisation will produce speedy action".

"Proposition 3: The greater the procedural memory level, the greater the likelihood that improvisation will produce action low in novelty" (p. 710).

Moorman and Minor do however caution that a high level of procedural memory can be limiting, which they argue is reaffirmed by Berliner (1994) (p. 709).

"Proposition 4: The greater the declarative memory level, the greater the likelihood that improvisation will produce coherent action" (pp. 710-11).

"Proposition 5: The greater the declarative memory level, the greater the likelihood that improvisation will produce novel action" (p. 711).

“Proposition 6: The greater the declarative memory level, the greater the likelihood that improvisation will produce action that proceeds at a slower pace” (pp. 711-12).

Moorman and Miner argue that while procedural memory encourages coherent and speedy action, it also increases the risk of automated behaviour. Conversely, declarative memory enhances novelty in improvisation but makes it slower to produce coherent ideas. Moorman and Miner therefore advocate a healthy balance of the two (p. 712).

Proposition 7 is: “...Combining procedural and declarative memory can enhance the probability that improvisation will produce coherent, novel, and speedy action” (p. 713).

Moorman and Miner argue that collective improvisation amongst jazz musicians can iteratively become standardised over time, thus using improvisation as a compositional tool in itself (p. 713). This is a crucial aspect of my methodology discussed in chapter 3 and adds further credence to the use of improvisation as a medium to compose with.

The final two propositions address the impact improvisation has on organisational memory and competence, rather than the previous ones that were concerned with the effects of organisational memory on improvisation:

“Proposition 8: Improvisational actions can serve as unplanned experiments that generate enhances in an organization’s procedural and declarative memory” (p. 714).

“Proposition 9: The greater the organizational improvisational level, the more likely an organization will to develop a higher-order organizational competency in improvisation over the long run” (p. 715).

Tommy Tedesco’s seminal text *For Guitar Players Only* (1979), also advocates both conventional and unconventional approaches to position playing for the guitar. On pages 15-19, he argues the importance of learning all the notes fluently on one string. This unconventional technique reinforces an understanding of the fretboard geography, according to Tedesco. However, I have also found it offers much greater

tonal consistency and is particularly useful for playing single note melodies. This is something very few guitarists seem to practice or educators seem to teach, yet it a technique which provides a major tonal advantage as well as helping students to learn the notes up and down the fretboard and not get locked into playing the same muscle memory based patterns. It could be argued this technique draws on a greater sense of explicit memory therefore.

More critical responses to muscle memory are seemingly uncommon in authoritative texts. However, guitarists such as Wayne Krantz and Bill Frisell both take alternative positions to the previous sources. Krantz' 2004 book *An Improviser's OS* offers a contrasting perspective. For Krantz, unlike other texts reviewed here, the need for a guitarist to be able to challenge procedural memory is clearly a priority as this is what he believes allows an improviser to truly flourish musically: "Rhythm, melody, harmony and sound, free of generic reference, idolatry and derivative affectation, are expressions of the self" (p. 5).

Krantz presents a series of 2,048 "formulas" which include conventional triads, arpeggios and scales as well as every other possible note combination on the guitar fretboard. Krantz conceives the formulas as being totally different to scales and chords:

> The word 'scale' implies an orderly sequence of notes learned by rote; a known quantity with little potential for reinvention. 'Formula' suggests a blend. A concoction; something open-ended and without a tendency toward any particular order... (p. 40).

Krantz argues the importance of formulas over scales and chords as they do not rely on muscle memory. Rather, Krantz encourages a good knowledge of note names and essential theory to access the sounds.

Krantz also discourages the use of any muscle memory approach in learning the formulas in the book:

> In this mapping-out process of the formula it's important not to reduce the sequence of available notes up and down to mechanize it and reduce it to a

> pattern...that's an important goal: to not remember a single formula's location anywhere on the neck. Instead, every time that access to a formula is needed, it is searched for by note name or function as if for the first time, regardless of how many times it has been searched for before (p. 52).

Krantz offers further advice on the best methods for practicing the material, suggesting an effective strategy is to use divide the guitar fret up visually into four fret zones which can cover any four frets. Ultimately, the logic here is that each finger can then be assigned to a corresponding fret which makes it easier to focus on the theoretical aspects of learning and less on the physical. Once the player has chosen a zone to work with, he/she can then input one of the many formulas from the book (p. 49).

Krantz also debates the topic of how limited resources to improvise with can nurture creativity (something corroborated by a masterclass I attended at Birmingham Conservatoire by trumpeter Dave Douglas circa 2005):

> A limitation can't sound bad; only what we do with it can. The limitation is an opportunity to build improvisational muscle. As noted previously, what makes music sound good isn't which notes and intervals are used, or how many, but how they are used (p. 54).

Krantz explores the various modes that can be derived from the formulas, alongside a number of "subsets" which provide an even more expansive range of permutations to work with (pp. 60-65). To conclude, Krantz covers a number of short questions relating to how ideas generated from these methods can be later standardised if one so chooses as the basis for writing a composition. Krantz also suggests that these formulas can provide an alternative approach to soloing on changes by accentuating the use of non-chord tones to create greater improvisational colour (pp. 76-77).

Bill Frisell's chapter, *An Approach to Guitar Fingering* from John Zorn's 2000 book *Arcana: Musicians on Music* presents a short overview of Frisell's own approach to guitar fingerings and how this enables him to achieve his own inimitable guitar sound (pp. 140-44).

Frisell discusses how most guitar method books typically address fingering from the perspective of what position a passage should be played in. However, Frisell presents a series of examples that incorporate all the various strings, often ringing out over one another akin to a piano sustain pedal. Frisell gives examples of his own finger positions for various scales, harmonics and triads before following this with a short series of etudes using this approach (pp. 140-144). Frisell's chapter, much like Tedesco (1979), presents a method of guitar playing which prioritises the desired sound and makes the guitar fingering work to suit this whereas normally guitarists will choose the fingering based on what is physically the most logical to play. Although my own approach to fingering is slightly different, some of these open string sounds reminiscent of Frisell's ideas feature in a few of my recordings. One of the techniques I in fact most enjoy using to enhance this style of playing is shaking the guitar neck very slightly while playing an open chord which creates a natural tremolo effect, particularly effective with arpeggios.

(III) Summary of Findings:

This literature has shown there is general consensus in favour of musical muscle memory use especially within guitar pedagogy which typically promotes a more standardised way of playing using fretboard diagrams, tablature, chord symbols/boxes and aural demonstration. There seems to be minimal literature which takes a more critical position towards muscle memory use for the guitar. Although the reason for this is not apparent within the sources I have looked at, it would be reasonable to suggest these findings are indicative of the guitar's broader standardisation and its expanding role within music academia. It is also reasonable to assume that as standard tuning as we know it has not really diversified greatly in recent years, it is reasonable to speculate that there will be a very high dependency on established finger shapes and patterns that everyone relies on.

These sources also suggest there is still a problem among guitarist students who do not learn muscle memory correctly to begin with by practicing slowly, something I have experienced in own teaching. There is also a lack of material which discusses musical muscle memory in the broader context of physiology like Sudnow does, as well

as sources which focus on the transition and technique required to execute finger patterns on the guitar as chord boxes, tablature and notation do not address this directly. This has led me to consider how I might be able to discuss muscle memory motions more so in my own work as this could be a basis for new knowledge creation. As we have seen, sources such as Dean (2014) have argued that poor insight into such motions can lead to an inadequate standard of musical transcription.

The literature suggests improvisers should be better informed about procedural and declarative memory use in order to be able to make more informed decisions when playing music. The concept of using limited resources as a basis to inspire greater creativity discussed by Krantz (2004) is not addressed widely either. This is significant as it can be an effective tool for circumventing over-reliance on existing muscle memory ideas.

The existing literature also does not explain why music psychology texts do not use the term 'muscle memory' whereas less scholarly articles like Jenkins (2016) are more open to acknowledging academic terminology. My findings suggest this is a term that is used somewhat informally and may therefore lack credence within traditional sources. However, given the lack of scholarly information about muscle memory relating to the guitar and its relevance to my own method of composition, I would identify making this link between guitar pedagogy sources and more authoritative texts as a further premise for the creation of new knowledge.

2.3 Notation methods

(I) Introduction:

My own exploration of alternate tunings poses a significant question about how best this work should be documented. This section will evaluate existing notational methods across a variety of musical contexts which I will use to inform my own methodology in chapter 3.

There is debate around the prescriptive and descriptive functions of music notation, as this review will demonstrate. Prescriptive notation presupposes the score becomes the primary musical artefact whereas descriptive notation tends to serve either as a

more subjective score or a transcribed visual representation of the recording, which instead becomes the primary artefact. However, these two approaches are not binary as some sources discuss scoring methods which use a combination of both prescriptive and descriptive elements.

I will begin with sources which advocate a more prescriptive approach to musical notation, followed by sources which take a more moderate view and finally ones which promote a descriptive approach. The sources will include composers who write for the guitar, improvisers, composers and scholars within jazz and contemporary music. I will also examine several computer-based methods used to produce guitar transcriptions and assess their validity in relation to my own work.

Corey James Flowers' DMA thesis *Altered States of Performance: Scordatura in the Classical Guitar Repertoire* (2015) describes the use of tablature as a prescriptive resource which was fundamental for the dissemination of scordatura use (p. 9). Earliest examples of guitar tablature were well-documented by the Renaissance and examples are addressed in Tyler (1980) which includes *Fantasie* by Adrian Le Roy from *Premier Livre* (1551), part of a broader series of tablature publications he produced (p. 114).

Flowers states however that as standard notation gained popularity over tablature more modern methods of scordatura notation have relied on using alternative methods of notation such as using two staves; one to indicate the finger positions and the resultant sounds on the other. The other method Flowers suggests is a combination of tablature and notation at pitch.

This latter method is what we see in guitar magazines such as *Guitarist, Guitar Player, Guitar Techniques* and *Total Guitar* which tend to include tablature as a more prescriptive tool with standard notation acting as a visual representation of the recording. In addition, these transcriptions often include a series of chord boxes, finger patterns and a detailed written breakdown of what to play, facilitating the player's development of correct technique and muscle memory required to perform the repertoire.

Hawaiian slack-key and early blues guitar sources indicate this music originates from oral music traditions hence the absence of notation. However, there have been various transcriptions of early twentieth century blues guitar recordings published recently such as Stefan Grossman's *Early Masters of American Blues Guitar: Country Blues Guitar* (2017) which is part of a broader series of early blues guitar transcription books by Grossman.

Experimentation by folk, jazz, pop and rock guitarists with alternate tunings from the late twentieth century along with a more recent increase in online tablature websites, guitar magazines and published transcription books have resulted in a huge resurgence in this method of documentation, which we know has been around for hundreds of years (despite Eddie Van Halen's claim he invented it in his 2015 interview with Denise Quan entitled *Is Rock 'n' Roll All About Reinvention?*).

(II) Literature Review:

Texts which address prescriptive aspects of Western notation include *Collected Writings* by Brian Ferneyhough (1998) and *The Contemporary Arranger* by Donald Sebesky (1994). Ferneyhough presents notation and sound as two disparate elements, arguing: "Both – score and sound – are sign systems whose primary fields of signification must always remain their respective opposites" (p.3). Ferneyhough advocates the explicitness of the score working in favour of the composer's intentions and the importance of furthering this process. However, he also explains that as the disparity between sound and score get closer through making the scoring as explicit as possible, the most desirable, purely interpretative elements from the performer come to fruition. While Ferneyhough's scoring approach is therefore very prescriptive these findings suggest the recording takes equal precedence to Ferneyhough.

This is further evident in Ferneyhough's writing for the guitar. *Kurze Schatten II* for solo guitar (1990) consists of a highly prescriptive polyphonic score and also utilises Fernyhough's own application of microtonal scordatura, tuning the guitar strings by as little as a quarter of a tone (pp. 139-152). This is a guitar practice originating from the use of scordatura as early as the 14th century I discussed earlier. Ferneyhough also

makes explicit use of irregular time signature scoring, using 2/10, 5/16 and 7/20 (p. 362).

Sebesky's approach to notation is more prescriptive than most jazz scores, emphasising specific textures and a generally homophonic arranging style. Sebesky takes a layered approach to his orchestration, focusing on three levels of instrumental sound, categorised as: primary focus level – the soloist (e.g. trumpet, sax, etc), secondary focus level – background (e.g. sax section, strings) and tertiary focus level – rhythm section (e.g. bass, drums, guitar, percussion, piano) (pp. 4-5).

Sebesky however claims that: "This distribution is never static and one focus level can rise and fall accordingly with the arrangers intentions." Sebesky is pragmatic in his scoring approach, always attentive to the most effective instrumental ranges and combinations, offering several rhythmic, chordal and linear guitar examples. For instance, in Ex 228 which gives explicit notational detail so the guitar part can blend with the rest of the orchestration, discussed on p173. Sebesky continues with exploring the best ways to score voicings and single line passages for the guitar (pp. 174-75).

The following sources take a more moderate position towards prescriptive and descriptive notation methods:

The article *Opening Offer or Contractual Obligation? On the Prescriptive Function of Notation in Music Today* by Christopher Fox (2014) examines the diverse ways musical notation has been used throughout the twentieth century in both prescriptive and descriptive settings, arguing: "Notations may be an idealised visual representation of how a piece of music sounds, or they may be a set of instructions for performers to use to produce a musical event" (p.6).

Fox argues most composers use their scoring skills both prescriptively *and* descriptively, claiming there is an inevitable disparity between score and performance in every situation that should not necessarily be seen as a fault on the composer's part (p. 7). Fox cites John Cage who became increasingly fascinated with sound experimentation which proved difficult to notate, arguing it is ultimately a matter for

the composer to decide how much interpretation should take place by the performer (p. 7).

Conversely, Fox claims there can be pressure on composers to work within the confines of standard notation in commercial situations. However, Fox states this gave him "...a much greater sense of the different sorts of interpretative space that could be incorporated within notations that, at first glance, appeared quite conventional" (pp. 8-9). For instance, Fox discusses scoring individual parts for a vocal ensemble without the others able to see what each member had, stating that this: "...overcame the singers' instinctive desire to behave like an ensemble and instead to sing freely, individually and with no regard for coordination" (p. 8).

Fox discusses the graphical and aleatoric scoring methods which developed in the 1950s, highlighting *Concert for Piano and Orchestra* by John Cage (1958) as an example where the score does not contain all of the work that was actually performed. Fox presents a series of his own graphic scores inspired by the works of Mauricio Kagel, Karlheinz Stockhausen and John Cage. There is also reference to the text score, where Fox cites *4'33* by Cage (1952) as an early example. Fox makes a significant comparison between the more prescriptive functions of text scores and the descriptive aspects to graphic scores (p. 14).

Fox closes by discussing how managing text, graphic and conventional notation in his own scoring practice has allowed him balance prescriptive and descriptive elements in a way that most suits his composing. He gives an example of his piece *Hearing Not Thinking* (2006-2008) which uses a different method of scoring for each instrument, indicating that all the instruments written for are not meant to be played together, only a selected four (p. 17).

Fox concludes: "...I remain optimistic that the resurgence of interest in different ways of thinking about notation...will continue and flourish" (p. 19).

Mieko Kanno's article *Prescriptive Notation: Limits and Challenges* (2007) analyses the advantages and drawbacks of Western notation. Kanno defines prescriptive notation as:

> ...a notation system in which the composer specifies the method of making music...prescriptive notation tells us what to do with the mind, body or instrument in order to produce the sound of a musical work.

Kanno argues notation serves a number of purposes including allowing composers to notate music for performance and publications; performers to read to get to know a piece and also to perform it as well as musicologists and musicians who use notation for their own analysis. He highlights the precedent the score is given in classical music to the performance itself, explaining that such a notational system is problematic because the same standardised system is being used as a method of both prescription and description indistinguishably, making it subjective and susceptible to misinterpretation. He states prescriptive notation can effectively be "resultant", indicating the desired sound or "action" based, indicating how the performer should produce the desired result.

Kanno defines descriptive notation as: "...a two-dimensional, visual equivalent of a recording". However, truly accurate production of descriptive notation is a challenge, he claims, arguing many composers feel a work is only adequately complete when the score is supplemented by a recording.

He contrasts the effects of employing prescriptive and descriptive notation, even when the musical results are almost indistinguishable (i.e. eye music): "...in the course of a performance there is a difference of effect on the psychological state of the performer when reading one notational approach rather than the other." He adds within a descriptive scoring context, a performer need not be aware of how specific fingering gestures relate to musical passages whereas in prescriptive notation, the performer will be aware of the figuration though not necessarily the resulting notes.

Kanno concludes:

> "The diversity of prescriptive notations, and their acute differences from descriptive notational strategies, pointedly remind us that notation is a means of articulating music and is not the music itself."

The essay *Prescriptive and Descriptive Music Writing* by musicologist Charles Seeger (1958) discusses the issues around the prescriptive and descriptive contexts in which traditional musical notation are employed. Seeger describes musical notation as a symbolic, linear-based system originating from the Greek tradition, where left to right represented time elapsed with symbols added as appropriate to represent pitch and later refined throughout the Christian era. Seeger argues notation originated as a descriptive practice which has become more standardised and prescriptive (p. 186).

Seeger contends this encourages the use of a relatively limited, standardised method to describe sound which is problematic within the Western art tradition as music from other cultures cannot be adequately notated as well the composer's assumption that musicians will be able to convincingly read and interpret such music because it is notated in a standardised way (pp. 186-87). He suggests we can increase the number of notation symbols used though the benefits are likely to be minimal as well as making reading more complex. Another option is to decrease the use of symbols and explore more graphic possibilities, claims Seeger.

Seeger argues the oscilliograph provides a more suitable transcription platform as it more effectively satisfies the requirements of both prescriptive and descriptive scoring (p. 187). A series of visual examples follow, including one graph on p. 189 which also incorporates a line of standard notation. Seeger summarises: "As a descriptive science, musicology is going to have to develop a descriptive music-writing that can be written and read with maximum objectivity" (p. 194).

The article *Plastic Music, Aural Models and Graphical Representation* by Rick Nance (2010), discusses two of his works that use samples (through heating metals and manipulating paper) to create a series of aural instructions for the cellist or trumpet to interpret via headphones in the place of a score. The audience however only hear the interpretation and electronic effects. One of the cellists, Thomas Gardner in fact uses visual symbols he has derived from Nance's original aural model. Nance is sympathetic to this, asserting: "Since this is his visual representation of the aural model, I can accept its adherence to the aurally centred program".

Much like the history of tablature for the early guitar and lute, the origins of graphic notation originate from centuries earlier. This is exemplified in Trevor Wishart's book *On Sonic Art* (1996) which includes visual illustrations of ancient hieroglyphic symbols and neumes (a very early system of musical notation indicating the general shape and gesture of a musical phrase) (p. 19, 21).

A particular style of graphic scoring practice became increasingly common from the 1950s onwards and has permeated much contemporary classical, electronic and improvised music repertoire. Prominent examples of this include 'De Kooning' by Morton Feldman (1963), 'December 1952' by Earle Brown (1954), 'Kontakte' by Karlheinz Stockhausen (1960) and 'Threnody for the Victims of Hiroshima' (1960) by Kryzstof Penderecki.

Other examples of graphic scoring practice can be seen in the work of John Zorn's use of graphic symbol cards discussed in his documentary video of his 1987 release *Spillane.* Ronald Radano's text *New Musical Figurations: Anthony Braxton's Cultural Critique* (1993) also contains a series of graphic scores in more of a free jazz context.

Sources which advocate a descriptive approach to notation include jazz writings such as Graham Collier's book *The Jazz Composer: Moving Music off the Paper* (2009) as well as online journal articles such as *Out of Notes: Signification, Interpretation and the Problem of Miles Davis* by Robert Walser (1993) and David Borgo's essay *Free Jazz in the Classroom* (2007).

Other sources include the articles, *Who Actually Needs Transcription?, Notes on the Modern Rise of a Method and the Postmodern Fall of an Ideology* by Marin Marian-Bălaşa (2005), *Alternatives to Traditional Notation* by Mark Gaare (1997) , Larry Ochs' chapter *Devices and Strategies for Structured Improvisation* from John Zorn's 2000 publication *Arcana: Musicians on Music* (pp. 325-35), Bob Ostertag's chapter *All The Rage* from the same book (pp. 193-202) and *Transcription and Analysis Guidance Notes* by Simon McKerrell (Date Unknown).

Collier (2009) discusses how jazz often uses improvisation as a medium to compose with. In referring to tunes such as *Cottontail, Anthropology*, *Ornithology* and how they have developed from their original show tune form, Collier claims:

> Melodies such as these may have been thought out in isolation, but some, at least, were undoubtedly the result of something developed while improvising on the original melody and chord sequence (p. 24).

Walser (1993) goes further in suggesting the analytical approaches used towards jazz transcriptions are in fact flawed as Miles Davis' solos convey musical nuances that clearly cannot be expressed through standard notation. Walser cites Chick Corea's comment that: "Miles' solos are really interesting to look at on music paper, because there's nothing to them...without the feeling he puts into it, there's nothing there" (p. 360).

Walser refers to these more expressive musical aspects, citing Henry Louis Gates Jr's concept of "signifying" and "signfyin" (something Katz also highlights), arguing musical meanings (one subjective, one more objective) can be derived from the same piece:

> ... Signification is logical, rational, limited; from this perspective, meanings are denotative, fixed, exact, and exclusive. Signifyin', conversely, works through reference, gesture, and dialogue to suggest multiple meanings through association (p. 346).

In referring to his 2005 interview with Mark Dresser, David Borgo's essay *Free Jazz in the Classroom* (2007) reinforces some of these same broad concerns about standard notation:

> ...western notation, when used to convey aspects of jazz and improvised music, tends to place undue emphasis on notes, chords and harmonic progressions...the rhythmic, timbral, expressive and interactive nuances....do not translate easily to paper.

Marian-Bălaşa (2005) examines the pros and cons of human and computer-based music transcription methods, arguing that aural transcription humanly carried out is selective in its regard to which musical elements are transcribed and further exasperated by the level of expertise of the transcriber, making it subject to some interpretation (p. 6).

Sonograms however, though easily produced and accurate in providing psychoacoustic information, lack the culturally-influenced musical nuances and sensitivity that only an experienced human element is able to provide. Essentially, neither method is completely objective, states Marian-Bălaşa (p6). She compares descriptive transcription approaches that focus only on essential notation with others which aim to make the transcriptions as close as possible to the performance, so it could be re-interpreted accurately by others (p. 8).

Following on from the development of graphic scores and computer-aided transcriptions in the 1950s, she discusses the experiments conducted by Charles Seeger and later G. List (1974) who made synoptic scores derived from different composers' transcriptions of the same musical piece, highlighting the differences in interpretation. According to Marian-Bălaşa, List (1974) argued transcriptions made by ear were in fact more accurate as interpretation of the sonogram or similar graph would be more open to misinterpretation, especially when trying to relate this to one's own experience of the Western notation system. However, computer graphs can be useful in advising transcribers on more technical details such as pitch and note value corrections, claims List (1974) (p. 9).

Marian-Bălaşa staes:

> ...a musical transcription is an artistic drawing, implying an always unique, relatively free, optional, and combinational play with graphic symbols. This play is equally subjective and objective, and...can be argued for or against, negotiated, and accepted or doubted...so there is an unpredictable amount of subjective capacity for hearing, identifying, and representing graphically what is performed as music (pp. 20-21).

Marian-Bălaşa concludes it is recordings, not transcription that is the definitive artefact (p. 22).

Gaare (1997) examines the longevity of traditional music notation alongside alternative methods, claiming there have been hundreds of proposals to reform traditional notation, usually centred around simplification including several tablature systems. Gaare highlights Johannes Wolf's *Handbach der Notation-Skunde* (1913), Kurt Stone's project the *Index of New Musical Notation* (1970-74) and Gardner Read's *Source Book of Proposed Music Notation Reforms* (1987) which codify various alternative proposals to standard notation. Gaare also references Arnold Schoenberg's approach to twelve-tone notation, Stockhausen's graphic notation, William F. Buckley's *Buckley Notation System* (where all accidentals are indicated in red and piano fingering is shown for every note) and Henri Carcelle's *Proportional Chromatic System* which uses a series of vertical time axis (1992).

He critiques the irregularities of standard notation, arguing Western notation does not represent atonal and microtonal music accurately, citing composers such as John Cage, George Crumb and Pierre Boulez who created "new notation symbols to be used in the traditional notation system."

Gaare states that guitar tablature "...was born out of the necessity for guitar players to communicate with one another on paper." He claims there is an inevitable drawback of each instrument having its own tablature system in an ensemble context due to the confusion of transposition and communication between musicians.

Ochs (2000) provides a number of descriptive transcriptions from his own recordings (p. 329-330). His focus is concerned with sound quality and its emotional effect rather than how accurately the scoring system reflects this. Rather, Ochs suggests this would be a matter of consulting the recording as the scoring here is more gestural for the performers to work from.

However, Bob Ostertag's chapter *All The Rage* (p. 193) from the same book presents a more detailed application of descriptive transcription (p. 196). Essentially, Ostertag's transcription and recordings are designed to be experienced together by the listener.

Finally, there are a number of sources which explore different computer-based methods for producing guitar tablature:

(I) *Inharmonicity-Based Method for the Automatic Generation of Guitar Tablature* by Barbancho et al (2012) proposes a new system for generating tablature from a guitar performance by processing the audio waveform and analysing the overtones of individual notes. The system can subsequently deduce which fret/string combination was actually used based on the inharmonicty of the specific note or chord.

(II) *Audio-Based Guitar Tablature using Multipitch Analysis and Playability Constraints* by Yazawa et al. (2013) proposes a method of guitar tablature generation from audio signals using a MIDI guitar synthesizer, emphasising this is conducive to greater fingering and pitching accuracy.

(III) *Automatic Transcription of Guitar Tablature from Audio Signals in Accordance with Player's Proficiency* by Yazawa et al (2014) presents an automated transcription system for producing guitar tablature that takes into consideration the constraints of an individual guitarists ability. Yazawa et al (2014) use a computer-based multipitch estimation method known as LHA (Latent Harmonic Allocation), to create a system which is able to calculate the most suitable tablature fingering based on performance inputted from a MIDI synthesiser.

(IV) *Possible Solutions to the Guitar Tablature Problem: Why an International Approach May be Best for All* by Lauren Myers (2012). Myers demonstrates the differences between guitar tablature and sheet music (p. 407), exploring the ambiguity of tablature. However, according to Myers there is a wide use of online forums where individuals can debate and collaborate to decide on the most accurate version, aiding a process of standardisation (p. 410).

(III) Summary of Findings:

This last section examined different scoring approaches and roles notation can play in a musical work. I initially presented examples such as Ferneyhough (1988) and Sebesky (1994) who both take a more prescriptive position to scoring techniques, followed by a number of sources which take a more neutral position, arguing both the pros and cons of this debate such as Seeger (1958), Fox (2014), Kanno (2007), Marian-Bălaşa (2005), Gaare (1997) and Nance (2010). These sources demonstrate that this is not just a binary issue; the prescriptive and descriptive aspects to scoring are closely infused. Rather, it is a question of how the composer uses the scoring methods available most effectively for themselves. Finally, I presented examples from a more jazz and improvisation background such as Ochs (2000), Collier (2009), Walser (1993) and Borgo (2007) who explicitly favour the score as a descriptive resource. The latter here was more congruent with a jazz methodology which suited my own practice of using transcriptions to visually represent my recorded improvisations in the portfolio.

The sources also suggest that modern applications of guitar tablature tend to be a method of convenience for guitarists where my own method uses the tablature as a basis for self analysis and as a tool to compose within its own right (for instance with my initial 12 studies). This application of using tablature as a method of self-analysis to generate notation is one area where I would submit there is a contribution to new knowledge therefore being made and may provide an invaluable aid to others who wish to work with unorthodox tunings and need a format to be able to retrospectively document their work and work out the standard notation from this, which can be then analysed in more objective musical terms.

Conclusion and Gaps in Existing Literature

This literature review presented findings relating to the three topics I outlined in my introduction. We have seen a diverse mix of non-academic sources in addition to more traditional texts. We have seen there is broad tendency among guitarists to favour standard tuning (which originates from instruments such as the lute and oud) for both historical and practical reasons. However, there also there is trepidation towards experimenting with a method which questions the existing theoretical and muscle

memory information the player has previously amassed. This minority interest is evident throughout all of the applications of alternate tunings examined and is reflected in other instruments such as violin and viola scordatura, where there is relatively little written.

While there are clearly some similarities between different historical applications of alternate tunings discussed there is not literature I could find which addressed the historical development of alternate tunings. We have also seen that alternate tunings are indeed part of both the classical tradition (through notated scordatura) and oral music traditions such as Hawaiian slack-key, early American blues and post-1960s British folk music. Modern guitarists across different styles have been particularly active in advancing the practical use of alternate tunings (e.g. Stanley Jordan) as well as examining their harmonic potential (e.g. Laurence Juber).

I have listed below where I found gaps in the existing knowledge base which will provide the basis for my methodology in chapter 3:

(I) There is a gap in the existing literature pertaining to some specific alternate tunings, more specifically regular tunings. I have identified and presented these tunings in the methodology table in chapter 3 (see **Figure 1**) which provides the basis for my practice-based work to investigate what new results can be gained from experimenting with these tunings. There is also a lack of academic literature discussing guitar string types/gauges and intonation which are both aspects of my own research interests. There is also no literature I could find addressing the near-century long gap between the demise of classical scordatura around 1750 and Hawaiian slack-key guitar from 1830 as well as a general lack of historical sources on alternate tunings.

(II) The literature shows a lack of discourse around the importance of practicing muscle memory correctly which I have also seen first-hand cause many problems for guitar students. In this sense, I believe this research

could contribute to a wider debate around how to devise new practices to address this.

There is also seemingly little literature that makes direct lineage between muscle memory issues guitarists constantly face and how this relates to the broader field of procedural memory discussed in music psychology sources. Most sources tend to take a binary position as to whether muscle memory use is a positive or negative factor when actually the question could be argued whether guitarists can achieve an optimum balance between procedural (implicit) and explicit memory in their playing and if so, what should that be and how do we achieve it.

(III) I could find no literature which discusses how the use of alternate tunings may provide an alternative solution to over-dependence on muscle memory. Sources typically suggest the player should change their muscle memory information in order to produce new results. However, my findings indicate that by changing the tuning, the player can retain muscle memory information and develop new sounds and musical ideas in the process. My research will focus closely on this area as a basis for new knowledge creation.

Chapter 3 - Methodology

From my analysis of the existing literature in chapter 2, I identified a series of tunings that, while given minimal scholarly study, were not being addressed by guitarists or existing sources, mainly through reasons of practicality. I therefore chose to focus my methodology on exploring the following tunings (**Figure 1**) and how I could create my own adaptation of them:

Figure 1

TABLE OF ALTERNATE TUNINGS

TUNING:	**NOTES:**	**STRINGS:**
Series of Solo Studies	All of the below	10-13-17-26-36-46 Halfround
DADGAD DROP C#	C#ADGAD	10-13-17-30-42-52 Roundwound
DADGAD DROP B	BADGAD	10-13-17-30-42-52 Roundwound
BbADGAD	BbADGAD	10-13-17-30-42-52 Roundwound
REGULAR CHROMATIC	AA#BCC#D	10-14-20W-28-38-48 Flatwound
REGULAR WHOLE-TONE	EF#G#A#CD	10-14-20W-28-38-48 Flatwound
REGULAR TRITONE	BFBFBF	10-14-20W-28-38-48 Flatwound
REGULAR MINOR 6TH	AFDbAFDb	10-14-20W-28-38-48 Flatwound
REGULAR MAJOR 6TH	BbGEC#BbG	10-14-20W-28-38-48 Flatwound
REGULAR MINOR 7TH	AGFEbDbB	10-14-20W-28-38-48 Flatwound

REGULAR MAJOR 7TH	AG#GF#FE	10-14-20W-28-38-48 Flatwound
UNISON/OCTAVE TUNING (Also known as 'Ostrich' and 'Trivial' tuning)	12 x Multi-tracked guitars each tuned to different note	10-14-20W-28-38-48 Flatwound

Composition Portfolio

My portfolio consists of twelve short studies and a series of larger scale improvisations using multi-tracked guitar parts, each demonstrating one of the tunings from **Figure 1** above. I initially composed the short studies using specific muscle movements on the guitar. The purpose of these studies was to accurately demonstrate how each tuning sounded compared to one another while playing the exact same finger motions and shapes. I began with standard tuning (EADGBE) which I used as a starting reference point. These studies were all played using D'addario EHR310 half round strings. The order of the studies and improvisations in the portfolio also follow that of **Figure 1**.

As there appears to be very little existing literature within this area from my findings, this approach to writing music based on a muscle movement aesthetic rather than the aural could present the basis for new knowledge and an avenue for future research which I discuss in chapter 5.

The bottom stave of tablature within the studies represents the physical finger positions and remains unchanged every time whereas the upper part represents the respective alternate tuning I used to play the piece and changes every time. These transcriptions can be compared with one another to see the musical implications of changing the tuning each time.

Each of the studies were around one minute each and based on six ideas, each lasting around ten seconds. These were approximately:

0.00 – 0.10: Introduction of open strings and harmonics.

0.10 – 0.20: Series of long slow single notes.

0.20 – 0.30: Series of longer single note phrases.

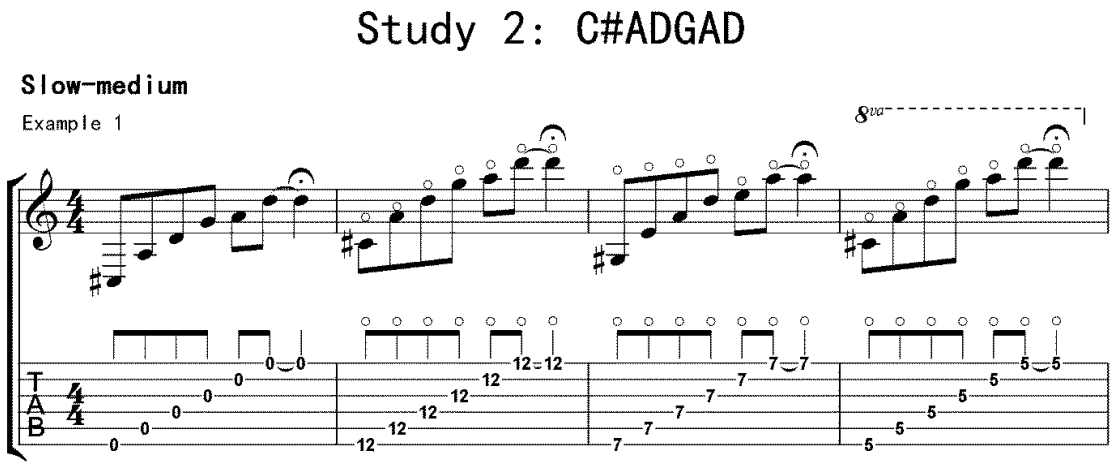
0.30 – 0.40: Series of diads and triads.

0.40 – 0.50: Series of chords.

0.50 – 1.00: Reprise of open strings and harmonics.

Figure 2 below is a short extract from one of the studies:

Figure 2



The portfolio then explores a series of more extensive improvisations for each of the tunings in **Figure 1**, each focused on demonstrating the harmonic and timbral potentials of the tuning in question. I often multi-layered guitar tracks to demonstrate the full breadth of sounds and harmonies that could be derived from each of the tunings. The final tuning comprises a larger scale work, using up to twelve guitar tracks and many of the previous musical elements I had worked with prior. Each string within this tuning is tuned to the same note, producing a unique sounding drone effect. This approach to using all twelve tones builds on my earlier work with chromatic tuning and some of the sounds I was generating influenced in part by Schoenberg, Messiaen and Bartok's work with twelve tone serialism. I discuss the construction of the portfolio in more detail in my commentary in chapter 4.

Working Method

Below is a step-by step overview of the approach I took to constructing the pieces in the studio and how they were subsequently transcribed into notation:

1) I established the tuning and string gauge I was going to be working with prior to the session. This experimentation with string types/gauges allowed me to explore the different potential tonal results that could be achieved. I discovered the brighter sounding roundwound strings for the DADGAD related tunings were more suited for accentuating a more open guitar string sounds reminiscent of an acoustic guitar and flatwound/halfround strings were better at delivering a more denser, mid-range tone which worked well for the regular, more darker sounding tunings.

2) I improvised for an unspecified amount of time using the tuning which was recorded entirely as a live studio take. I then improvised two more subsequent live takes to interact with the original recorded track, while using the audio file from the previous recorded take as a visual cue, similar to that of a graphic score with a timeline (see **Figure 10** for an example of this).

3) The unedited recording was then reviewed with the producer and edited where necessary, though in most cases the improvisations remained as live takes to preserve the spontaneous, real-time interaction between each of the constituent parts. An aesthetic decision had to be made each time in relation to this. In most cases, the live takes were entirely preserved as there was a natural spontaneity and interaction between all three parts that lost cohesion when edited too abruptly (e.g. see 'Babylon Bells' on the CD). Sometimes a decision was taken to just use one or two parts rather than three to create dynamic and textural variation.

4) The recording was then mixed by applying different processing to each guitar so that the parts would interact well together in the mix. This

involved production techniques such as panning individual parts, using chorus, delay, distortion, stereoisation, different microphones as well as EQ and compression.

5) Once the final mixed recording was complete, I began to transcribe the performance initially using tablature as I found this was an effective way to recall where specific muscle memory movements had been played. Also, as standard guitar notation tends not to give clear fingering information, the inclusion of tablature provided additional clarity. From this, I was able to better visualise the guitar fretboard and work out what the standard notation would actually be. I was also able to check the accuracy of my notation through comparing the recording and transcription with the playback function in Sibelius.

6) The use of standard notation allowed me to analyse the harmonies, rhythms, melodic and thematic ideas from the improvisations which I could then study in more objective musical terms. If there was a particular sound or effect I liked, I could also work out what it was theoretically and re-use it in future as a compositional tool (such as in **Figure 4**).

7) The presentation of my chosen scoring method went through several draft stages. While my earlier efforts were based on more traditional notation (similar to the solo studies in the portfolio), I found using standard notation to accurately describe my complex multi-guitar improvisations became increasingly difficult to do and rendered the notation unusable. I therefore devised a score retrospectively that was based on the previous transcribed material I had produced and focused on developing a visual artefact that would facilitate the recreation of the same sounds as per the recording (rather than exactly the same ideas). I chose to present the final scores in a spider-diagram style with the definitive alternate tuning scored in the centre in a bold box and the essential thematic ideas around the outside.

Bohuslav Schaeffer's score 'Nonstop' (1960) provides a good contextual example of this style of notation. Other scores such as Mauricio Kagel's piece 'Prima Vista' (1964) also utilise a similar style of graphic presentation.

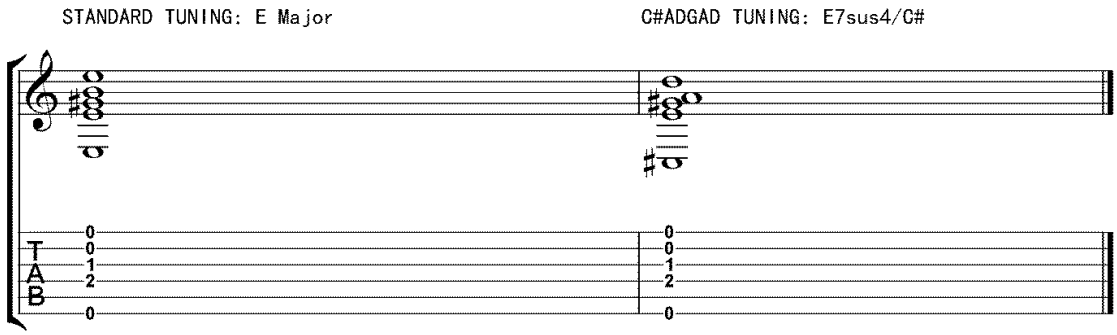
Giving the performer choice in the order in which the musical ideas are to be played and interpreted builds on a tradition of aleatoric scoring practice, discussed widely by Paul Griffiths in his text *Modern Music and After* (2010). Griffiths' aleatoric examples include Earle Brown's 'Twenty-Five Pages' (1953) (p. 109), Karlheinz Stockhausen's 'Klavierstück XI' (1953) (pp. 109-110), John Cage's 'Music of Changes' (1951) (pp. 27-29) and Morton Feldman's collection of graphic scored pieces 'Intersections' and 'Projections' (pp. 31-32).

8) After I had transcribed the essential ideas from the recording I set about producing a score based on the aural and transcribed material as well as an extensive directory of muscle memory shapes/patterns that would serve as a valuable artefact for another guitarist in reproducing the material (see **Appendices II and III**). The scored material presented within this portfolio therefore functions in two parts. The directory of muscle memory shapes/patterns provides prescriptive instructions on specific finger movements while the scores provide an overview of the desired sounds that are to be generated from using the relevant tuning.

Choice of Specific Tunings

From my findings, I could not find any applications of dropping the low string to C# or Bb within DADGAD tuning. While this is not an obvious thing to do as it would seem to make less harmonic sense logically, it does have drastic harmonic implications as the bass string inevitably changes the effect of the upper harmonies due to the harmonic tension created. This can yield some fascinating results. For example, **Figure 3** compares a standard E major chord voicing in both standard and C#ADGAD tuning:

Figure 3

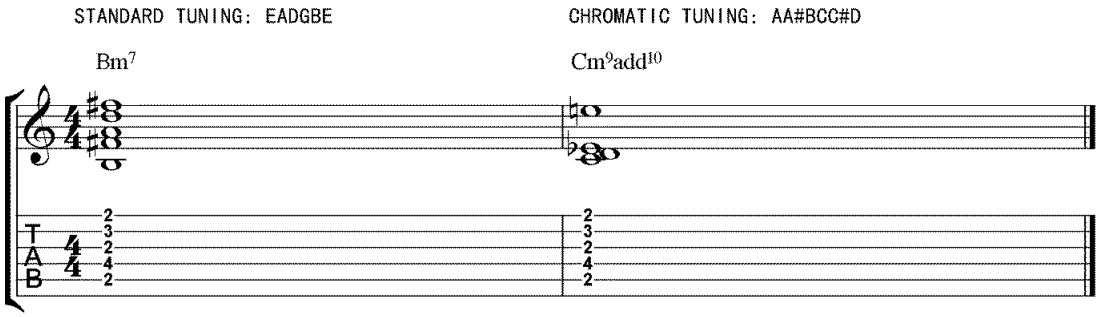


This second chord has a combination of close and wide intervals, such as the G# and A, but also the dissonant semi-tone difference between the low C# and high D is mitigated as there is a gap of over two octaves.

I have also found that slackening the bass string more considerably introduces different percussive and tonal characteristics to the guitar sound, though there are limitations in how far the bass string can be detuned before it becomes unplayable. Intonation can be significantly compromised once the low E string drops down a fifth to an A, for instance. Therefore, I found a lighter touch and tuning the string marginally flat helped to compensate for this, an idea I came across in James Taylor's Youtube video *Bonus Lesson: TUNING - Official James Taylor Guitar Lessons* (2012).

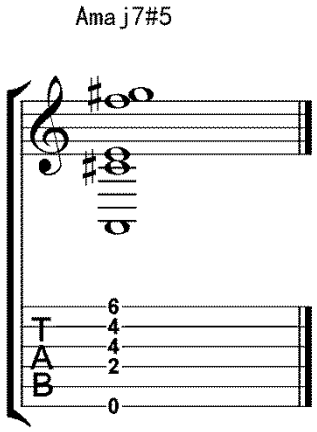
In chapter 2, I evaluated the pros and cons of procedural memory use among guitarists. However, as changing the tuning had a substantial effect on the sound of the guitar, I found I could use familiar scale and chord shapes that sounded completely different both harmonically and timbrally due to the employment of the new tuning. Of course in some cases, this did not create an aesthetically appealing musical result. For example, **Figure 4** demonstrates a popular minor seventh chord voicing in standard tuning, known for being a standard safe choice among rock and pop guitarists. However, the same shape in my adaptation of chromatic tuning produces a C chord with a 2nd, minor 3rd and two major 3rds!

Figure 4



In this scenario, my approach was to adjust the pattern or shape until I arrived at a sound I thought worked well. For instance, one of the new sounds I discovered in chromatic tuning (AA#BCC#D) was the following major 7#5 voicing, which would have been inconceivable and unplayable in standard tuning:

Figure 5



However, making these aesthetic decisions was always very subjective and I found it is natural to want to make sense of or rationalise an obscure sounding tuning so it does not sound too dissonant (for instance, in one extreme case I found I could play a minor blues chord sequence very effectively in whole-tone tuning!). Therefore, I endeavoured to focus on using musical ideas for each tuning which demonstrated its character irrespective of its sound. For instance, open strings, harmonics and parallel harmonies all demonstrated the intervallic nature of the strings, as can be heard in my recordings.

The regular tunings listed in **Figure 1** presented considerable practical challenges to successfully implement due to the extreme close and wide intervals. However, I decided to evaluate potential ways to circumvent this issue. These are the options I examined:

Option 1: Using a different string – this certainly provided a credible alternative to the problem but to properly implement this I calculated it would cause a considerable change in string tension exerted on the guitar neck. For example, in order to attain purely chromatic tuning I could replace the low E with another A string and use two additional G strings on the top. From studying the string information on a standard set of D'addario EXL110 electric guitar strings, this would cause an overall increase in tension of 3.5 lbs. There is also a natural timbral variation between the different strings. For instance, some are comprised of a steel core and nickel wound whereas some are completely plain. In addition, the different tension and thickness of each string creates different inharmonicity (range of overtones) which added a significant timbral advantage to my summative piece 'Twelve Constellations' where each of the strings were tuned to the same note.

Option 2: Use studio technology to transpose the octave. While pitch shifting software plug-ins have made this more accessible within the DAW (digital audio workstation, such as Logic in this case), the technical editing and listening it would require to find every note within the improvisation played on the relevant strings and then transpose accordingly would be virtually impossible to implement. Accurately employing such a plug-in without introducing digital artefacts or inadvertently transposing the wrong string would be almost impossible to achieve as there are numerous uses of open strings, harmonics and their overtones occurring that are at the correct pitch I would not want to change. There is also a natural degree of intonational *in*accuracy that is part of the guitar sound and performance aesthetic that can be lost, especially if used on chordal playing.

Option 3: Play only 3-4 strings. Obviously, this impacts the breath and range of the guitar to a large extent but would preserve the intervallic ranges.

After evaluating the above options to try and solve this problem, I decided to experiment with changing the octave register of the open strings where it became necessary. This can be observed in the recordings and transcriptions in the portfolio. While this may be seen as contrary to preserving the "pure" intervals of the tuning, it should be remembered that a similar practice is already very well established within Nashville tuning, giving it its characteristic sound. In addition, I found changing the octave register of the strings created a unique sound of its own as the order of the strings no longer corresponded exactly to the order of musical pitch.

Choice of Keys

The choice of key used for each tuning was based on maximising the range available on the guitar to accommodate the tuning. For instance, the wider interval tunings necessitated having the bass string as low as possible in order to preserve the intervallic ranges across the guitar and minimise having to displace the octave register unless absolutely necessary. However, I also wanted to include a variety of keys within the repertoire in the portfolio which is particularly evident in the detuning of the bass (E) string going down to A, Bb, B and C#.

Choice of String Gauges and Materials

The range of string gauges available for the guitar is beyond extensive and could easily provide scope for future research. Therefore, for this portfolio, I focused on exploring a cross-section of string gauges and materials that I felt were most representative of the different choices available to electric guitar players and would yield a contrast of results in my composition work. These were: D'addario NYXL 10-52 nickel roundwound, D'addario ECG23 10-48 flatwound and D'addario EHR310 10-46 Halfround. The specific individual strings in each set are detailed in **Figure 1**.

As a guitarist, I work with different string gauges and types in my own playing across a variety of styles. Both of my 1979 Ibanez 2630 guitars are set up with 10-48 flatwound strings. The first has relatively high action, which gives it more resonance and tone. Like most semi-solids, it is an extremely versatile guitar and was seen as a major Japanese competitor to the Gibson 335 in the late 1970s/early 1980s. One of the key

differences with this set of strings is the third G string is wound and particularly thick (.20) relative to the others in the set which makes executing full tone bends more challenging (hence why there is an absence of this in the portfolio!). My other two guitars (used more for rock and pop) currently have 10-46 halfround strings on them, with the .17 G string allowing for the execution of full tone bends much more easily.

In addition to the greater intonation stability I have found heavier strings can provide, there are also significant tonal qualities between the different strings explored within this portfolio, as can be heard in the recordings. Roundwound nickel strings generally provide a brighter tone and accentuate upper frequencies more so than flatwound strings which vibrate less and sound more mellow, accentuating the mid-range more. This is discussed further in chapter 4.

Summary

The essence of the compositional method used here is based on a real-time, call and response improvisation between the individual guitar parts. The pieces in this portfolio therefore prioritise the experimentation of musical sonority, timbre, texture, intuition and spontaneity. The musical character of the pieces in the portfolio are brought about through the synergy created between the contrasting guitar parts. I found this was lost when I attempted to take a more refined approach to selecting and developing compositional material, as demonstrated in 'Babylon Bells'. This point relates back to my initial discussion in my introduction about defining jazz as a way of thinking rather than by its quantifiable musical components.

This methodology combines an iterative approach to working with the different tunings, while using a pragmatic approach to dealing with issues of implementation. This is also the case for notation, where I focused on creating a score that could be used as a useful artefact for another guitarist rather than trying to inaccurately reproduce an exact transcription of the recording. The methodology also embraces the use of different string gauges/types as a basis for comparison.

Throughout the recording process, I constantly refined my working method. The musical ideas, studio processing, string choices and approach to arranging all became

more definitive. Whereas the initial recordings were more experimental in nature, the latter material in the portfolio introduced a greater sense of thematic development and musical space, sounding more like finished works. I also began to explore a range of alternative keys, tempos and feels to see what different contexts I could apply the tunings to.

The use of open strings and harmonics in the portfolio particularly demonstrate the unique quality of each alternate tuning. The method behind the solo studies demonstrate the impact changing a tuning can have on the same muscle movements across the guitar fretboard too which significantly contributes to and questions the existing preconceptions guitarists have about the need to change muscle memory to develop new musical ideas. The application of presenting guitar tablature as with the studies in this portfolio also poses a new model of aleatoric-style scoring whereby pieces could be written in tablature form with the tuning left open to be decided by the player afterwards.

Chapter 4 – Commentary

Introduction:

In this chapter, I discuss my practical studio work which resulted in the recordings and scores contained in the appendices. I have addressed each piece chronologically to demonstrate how this process evolved. My portfolio of compositions (documented through recordings, scores and this commentary) focus on the exploration of eleven unorthodox alternate tunings as a method for producing new musical ideas and timbres.

The musical notation and directory of muscle memory shapes/patterns which accompany these pieces provide a visual representation of the recordings as well as giving prescriptive information for how to recreate similar results. The notation also demonstrates in more analytical terms the effect that changing a guitar tuning can have on the same muscle memory patterns when played on the guitar and how using alternate tunings can in fact serve as a potential solution to an over-reliance on existing muscle memory, a common issue for guitarists.

My use of guitar tablature also served as an important method of self-analysis throughout my research, allowing me to study the muscle movements I used in the improvisations and therefore convert these into standard notation with greater accuracy.

Following my analysis of scoring methods in chapter 2, I discovered that combining the use of prescriptive and descriptive notation is actually relatively common. In addition, using the score as a visual representation of the recording is indeed well supported in the sources I referred to such as Fox (2014), Kanno (2007) and Walser (1993). Kanno in particular discussed prescriptive notation as being either a set of specific actions to be carried out by the performer or resultant, focusing instead on the desired result and less on how to achieve it. One of the most well-documented examples of resultant prescriptive guitar scoring would be Steve Vai's transcriptions of Frank Zappa's repertoire, documented in his book *The Frank Zappa Guitar Book* (1982).

My portfolio incorporated both of these prescriptive approaches discussed by Kanno. The short solo studies and scores derived from the recorded improvisations were notated in a more resultant style, prescribing the different sounds meant to be produced. However, my directory of muscle memory shapes/patterns is more action-based as the focus here is on giving prescriptive information for how to produce these results, rather than what they should sound like. For example, demonstrating the fingerings I used, whether I used a pick, thumb, first or second finger in the right hand as well as any other technical information such as the use of volume swells, tremolo, trills alongside a verbal description of how I used the shape and reference to an aural example.

Each of the solo studies used the exact same muscle movements each time to ensure an accurate basis for comparison between the sounds produced by each tuning. These ideas were based entirely on open string and natural harmonics which are fairly straightforward to play and reproduce by another guitarist using the notation and tablature. The open strings and harmonics used for each of the studies also allowed me to accurately convey the sound of the guitar tuning I was working with at the time. The structure of solo studies presented here are quite fugal in nature, reminiscent of Bach's *48 Preludes and Fugues* (also known as *The Well Tempered Clavier* and published across two books, each of 24 preludes and fugues in 1722 and 1742).

The longer improvisations in the portfolio required an alternative scoring approach to the solos studies due to their increased complexity. Initially, I tried producing a descriptive note-by-note transcription (like that of a jazz solo) but this became virtually impossible due to the abstract nature of the individual guitar tracks. While some sections could be transcribed, others proved extremely difficult leading to inaccuracies. Therefore, I began to look at how I could produce a score (rather than transcription of the record) focusing on the sounds that would need to be produced to recreate the same musical effect as per the recording.

These scores each presented the relevant tuning in the centre of the page and the core ideas accompanied with guitar tablature around the outside in boxes, often marked with an ad lib sign. A similar contextual example I discussed in chapter 3 was

Bohuslav Schaeffer's score 'Nonstop' (1960). Therefore, these scores and the directory could be used by other guitarists experimenting with these same tunings to produce very similar sounds. I often chose to score in an open key signature where the key centre was somewhat undefined on the recording or the tuning was based on a symmetrical scale like the chromatic, whole-tone, diminished and augmented sound. Similarly, I had to contend with the use of accidentals in the notation. In each case, I employed accidentals in a way seemed most logical to understand in line with musical convention, for example my score for the E whole tone scale on *Surf-Dale* uses E F# G# A# B# and Cx. I had to contend with a similar issue in my transcription of 'Augmented Realism' which although based on a 3/4 time signature, transitioned fluidly between 3/4, 6/8 and 12/16 throughout. The scores include lines in between each of the boxes meaning that the musical ideas presented can be freely moved between and developed accordingly.

I made a decision not to use bass clef for the guitar in the transcription process because I wanted the notation to visually demonstrate the extremities of the guitars new range of pitch within each new tuning. The five ledger lines below the stave demonstrate the low E being dropped to low A. However, where necessary, I did notate natural harmonics using *8va* and *15ma* symbols consistent with standard guitar notation practice. I found notating these harmonics accurately through the different tunings was one of the most challenging aspects of the transcription process. Firstly, I had to be clear about what tuning I was working with at all times to make sure I was able to work out the harmonic correctly but I also had to be mindful of the register changes that had been made to some strings to make sure the harmonic was notated in the correct register. In addition, guitarists will know that harmonics at the twelfth fret are at the same pitch as their respective fretted notes but at the seventh fret they are an octave higher, the fifth fret an octave and one fifth higher and two octaves higher at the fourth fret! I was able to use a combination of sibelius playback and my own playing to match the two to ensure accuracy, employing the use of the symbols 8va and 15ma as required.

The basic timbres and sounds of the recordings can be reproduced on a single guitar but reproducing the more interactive elements to the recording would require at least

two, likely three based on the recordings. The aesthetic decisions made in producing these compositions focused on how best to create a piece which was *most* representative of the tuning in question. Therefore, I tried to emphasise ideas that captured the sound of the tuning such as the use of open strings, harmonics, bass ostinatos, percussive sounds and chord shapes which produced unusual harmonies.

Structure of Portfolio – Disc 1 & Disc 2

The portfolio begins with twelve short one minute studies exploring each of the unorthodox regular tunings (identified in **Figure 1** in chapter 3) using half round strings. I then produced three larger scale improvised pieces using C#ADGAD, BADGAD and BbADGAD tunings (see *Etude for Two Guitars, Valentine Fog Clears* and *Not That That Helps*) using roundwound strings. This was followed by my exploration of the regular interval tunings using flatwound strings which comprise the remainder of the portfolio and culminate in a summative piece for twelve guitars.

My improvisations used existing muscle memory information I had established in standard tuning as a framework to begin with and from here I adjusted my fingerings where necessary in making aesthetic musical decisions when working with a new tuning. Prior to each recording session, I had not really worked with the tuning as I wanted to capture an immediate sense of spontaneity on every improvisation. Ultimately, each time I was trying to achieve a psychological musical state where I became completely immersed in the new tuning and was able to find the most effective way to play it that brought out its idiosyncrasies best. This usually took at least several minutes and multi-layering guitars also allowed me to develop pre-existing ideas that I had not fully developed on the first guitar take. That said, some of the most interesting musical results were captured at the beginning of the recordings as the ideas seem to be less contrived albeit under-developed.

The first half of the portfolio (**see disc 1**) represents my initial experimentation with alternate tunings, whereas the last seven pieces (**see disc 2**) demonstrate a more established working method and approach to developing thematic material. This culminated in a summative recording consisting of twelve guitar tracks, each tuned to a different note of the twelve tone scale in unison/octave tuning. The recordings

which resulted from this provide an essential artefact in supporting my contribution to new knowledge which I discuss in chapter 5.

Recording Set-up:

The guitar I used throughout this project was a 2015 Ibanez JSM10. As with all semi-solid guitars, it has an enormous versatility of tone, combining the best of both solid and hollow body guitar sounds. This particular model is a mid-high quality range guitar made in China featuring Ibanez super 58 pickups, a three way toggle switch, maple body with a sapele neck and 22 fret rosewood fingerboard. There is also an additional tri-sound switch which allows for the configuration of the pick-ups to be altered. However, this is generally not something I tend to have much need for as I prefer the natural sound of humbucker pick-ups.

Figure 6

The amplifier used throughout these sessions was a 2016 Fender tweed blues deluxe (40W) which has a 12 inch Celestion speaker. The valves were recently modified to allow greater clean headroom which is something I requested for playing jazz, though these are still the classic 6V6 type known for their warm, mellow tone, often favoured by jazz guitarists.

Figure 7

Figure 8

In terms of studio production, I have found recording solo guitar can be a challenge when trying to create an interesting sonic experience for the listener. Therefore, three microphones were used in addition to a direct input signal from the guitar (DI) to maximise the spatial possibilities from the guitar amp and have a variety of different timbres to work with. These were a:

(I) Shure SM57 placed right next to the speaker slightly off centre, the most conventional method

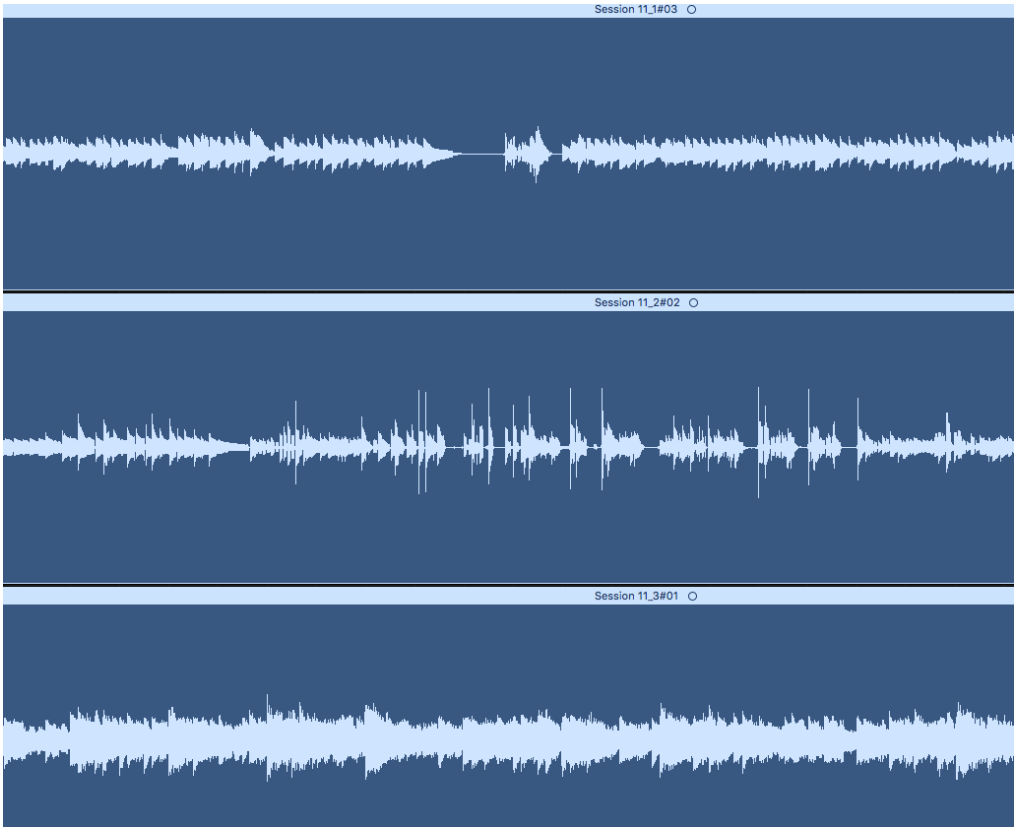
(II) Shure SM57 placed 3-4 inches from the speaker in a central position in direct line with the speaker cone for a brighter tonal option

(III) ATM33a condenser microphone positioned to the right of the speaker. This mic provided an alternative option to the two SM57s, offering a more sensitive response.

The recordings in the portfolio utilise a combination of the above microphones and the DI signal on occasion too. Using the recorded tracks, it was possible to mix together various combinations of microphone in order to achieve different timbral effects. Where I wanted a more clinical sound, the DI part could be used to a greater extent and where I wanted the natural amplifier sound any combination of the three microphones from above could be used.

Below is an example screen shot from one of the recorded files demonstrating how I used the first recorded guitar part as a graphic score to base the other parts on. Visual similarities and differences can evidently be seen:

Figure 9



I chose to multi-layer guitar parts for the improvisations for several reasons:

1. Using multiple guitar parts allow the tuning's full character to be explored more thoroughly and simultaneously as each part can be arranged within a certain register – e.g. 'Chinese Whipsers' comprises a swing walking bass part, mid-range chordal parts and repetitive harmonic phrase on the twelfth fret of the top two strings.
2. Multiple guitar parts allow for a call and response style of improvisation to occur – e.g. 'Augmented Realism' which is based on an interplay between all three guitar tracks.
3. Multiple guitar parts can be used to contrast different textures, sounds and techniques against each other – for example, the opening of 'Twelve Constellations'.

4. Multiple guitar parts can allow more interesting harmonies to be created, derived from the tuning in question – such as the latter half of 'Twelve Constellations'.
5. Multiple guitar parts create greater opportunity for producing more interesting studio productions – for example, panning the parts left/right/centre, using different EQ treatments on different tracks (see technical specification **Figure 10**).

Despite the contrasting sounds derived from the different tunings, the pieces and overall portfolio maintain a sense of coherence through the tonal resources I used at my disposal and working method which focuses on giving priority to the body over the mind rather than more conventional mind over body. This approach to using existing muscle memory in a new context to generate material is a key area of knowledge creation is also discuss in Chapter 5.

In most cases, the recordings in the portfolio are live takes. However, aesthetic decisions did have to be made around making edits and this was often influenced by the overall structure of the improvisation. It was important there was a key thematic sense to the piece but also that I explored a sufficient number of different ideas that demonstrated the character of the tuning I was working with. There was also a natural way in which ideas developed in real time I wanted the recordings to capture. However, superfluous musical ideas on occasion would be edited out along with anything that the producer or I considered to be an occasional technical error. It was also surprising to me how quickly a process of standardisation occurred when working with a new tuning. The first few minutes would always be quite daunting and I would have to contend with an immediate sense of self-doubt that this tuning would lead nowhere. Only through letting go of these thoughts and embracing the personality of the tuning was I able to develop the improvisations into coherent pieces.

The project was recorded in Logic 10.2 and used a series of software plug-ins. Below is a technical specification of most of the software plug-ins that were used on each of the recordings:

Figure 10

Track 1 DI	UAD Neve 1073 EQ Hi Pass @ 100 Htz (very musical EQ) Waves RBass to psychoacoustically add missing lows
Track 1 SM57	UAD Neve 1073 EQ Hi Pass @ 300 Htz 2dB mid boost @ 3.2 KHtz Logic X Tremolo panning hard L/R
Track 2 SM57	UAD Neve 1073 EQ Hi Pass @ 80 Htz Logic X Stereo Spreader Bus 1 UAD EMT 140 Reverb Bus 3 UAD Boss CE-1 Chorus (Maximum Chorus setting)
Track 3 SM57	UAD Neve 1073 EQ Hi Pass @ 300 Htz Logic X Modulation DDL Bus 2 Logic X DDL Stereo Delay
Master Bus	Fabfilter FF Pro-Q EQ to filter off low end below 100Htz Waves SSL G Series Bus Compressor Logic X Exciter boosting upper harmonics I/O to Drawmer Mercenary Edition 1968 Compressor Waves IM Pusher Psychoacoustic Processor PSP Xenon Bus Limiter

Guitar Strings:

The recordings explored a variety of different string types and gauges as a basis for comparison across the different tunings. However, as discussed in chapter 3, it was beyond the remit of my research to examine every string gauge and type relative to each of the tunings so I endeavoured to include a cross-section within the portfolio as a basis for comparison. I used D'addario EHR 310 half round strings for the first twelve

short studies, NYXL 10-52 nickel roundwound strings for next four pieces and ECG23 flatwounds for the remainder of the portfolio. **Figure 1** in chapter 3 details the exact set used for each piece.

The roundwounds offered a very bright tone and sustain which were effective for the earlier tunings I looked at in the portfolio which had a more open, folk-inspired sound. However, they proved more difficult to intonate with on the bass string when it came to the regular chromatic tuning, which is where I switched to flatwounds instead. I generally managed to mitigate this issue by tuning the string marginally flat and maintaining a lighter touch (a similar method I had previously found in the guitar work of James Taylor). The flatwound set also contains a third G string which is wound and was a .20, making it particularly challenging for string bends. Traditionally, flatwound string sets nearly always contain one wound string, the third (G) as this seems to be a preferred industry choice for tonal balance and intonation among players. However, players can of course customise their string sets how they wish, including using a plain G if they so prefer. The differences I found between roundwound, half wound and flatwound strings are discussed in my conclusion in chapter 5.

Compositions 2-4 all involved lowering the strings in order to achieve the desired pitch whereas the studies and other improvisations with regular tunings entailed a combination of sharpening and lowering strings in order to achieve the best interpretation of the tuning I wanted. I have detailed the transition I had to make from standard tuning to achieve the relevant alternate tuning at the beginning of each piece overview.

Composition 1: Eleven Short Solo Studies

I began the portfolio with eleven short muscle memory-based studies that demonstrated the differences between each of the tunings by playing the same exact finger movements. I developed ideas around picking, strumming and arpeggiating the open strings and natural harmonics. The finger exercises were exactly the same each time as to provide a strong like for like comparison to see how the tunings affected the sound produced.

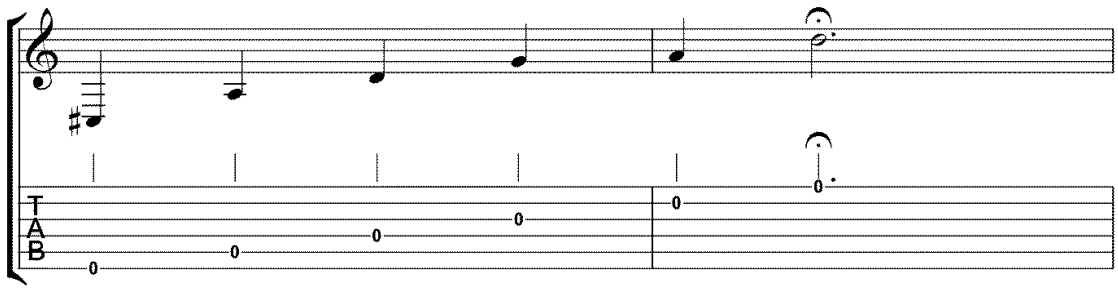
As I had previously established the existence of sources concerning alternate tunings based on regular thirds (e.g. Ralph Patt), fourths (Stanley Jordan) and fifths (Robert Fripp) in chapter 2 I chose to focus on the least common ones not addressed by Sethares' guide.

I began with standard tuning as a point of reference and worked through in the following order:

1. Standard tuning
2. BADGAD
3. BbADGAD
4. Chromatic AA#BCC#D
5. Whole-tone EF#G#A#CD
6. Regular tritone BFBFBF
7. Regular minor sixth AFC#AFC#
8. Regular major sixth AF#D#CAF#
9. Regular minor seventh AGFEbDbB
10. Regular major seventh AG#GF#FE
11. Regular unison/octave (also known as 'Trivial' or 'Ostrich' tuning) AAAAAA

Composition 2: *Etude for Two Guitars* (C#ADGAD)

Figure 11:



C# – dropped low E string down a fifth

A – no change

D – no change

G – no change

A – dropped B string down a tone

D – dropped top E string down a tone

The first improvisation in the portfolio was recorded in the tuning C#ADGAD (low to high). Although the tuning I derived this idea from, DADGAD, is very popular, dropping the low string to C# is something I have not seen in the existing material on alternate tunings. This was an initial experiment focused on exploring some of the potential timbral and textural possibilities available to me. The chosen format for this first recording was to improvise within the tuning for an open amount of time before reviewing the recorded take and using DAW software to edit this into a standardised composition.

I then added an additional guitar part, using a contrasting tone (in this case the middle pickup rather than just the neck) to help delineate one part from the other and facilitate the transcription process. This also helped to maximise tonal interest for the listener. I have also found contrasting guitar sounds can also help multiple parts sit well together in the mix.

These DADGAD tuning variants are very resonant open tunings that have a very evocative modal sound. However, dropping the low bass string to a C# in particular contributes to a more dissonant sounding tuning as the open strings now spell a C#b9b6b5 sound! The dropped B (BADGAD) tuning creates a Bm7#5 chord and the dropped Bb (BbADGAD) implies a Bbmaj6/7 sound respectively. The solo in the 'Etude for Two Guitars' (C#ADGAD) was directly inspired by the Pat Metheny Group's 1979 album *American Garage.* Some of the fast single note runs used in the following recordings drew inspiration from John McClaughlin's work, particularly around his time playing on jazz-rock albums such as Miles Davis' *In A Silent Way* (1969) and *Bitches Brew* (1970).

It is also worth highlighting that there is a tradition of solo jazz electric guitar that became increasingly popular and scored for by the likes of Barney Kessel, who

produced numerous solo transcriptions as well as being an early exponent of sweep picking (another technique I have used in the portfolio).

Some of the timbres I generated from these tunings (albeit not so much harmonies) bare slight resemblance to Derek Bailey's improvisations. Examples include *Solo Guitar* (1971), *Derek Bailey and Dave Holland Improvisations for Cello and Guitar* (1971), *Improvisation* (1975), *Music and Dance* (1997) and *Ballads* (2002).

My initial improvisation was approximately 11 minutes which was then edited down to 7 before overdubbing the second part. Guitar 1 begins with a series of harp-like arpeggios, with the guitar 2 following, sometimes in octaves. Guitar 1 then drops down into a bluesy, 6/8 rhythm on the low C# with guitar 2 accentuating the same rhythm using natural harmonics over the top. After a while, this leads into a more rubato, tremolo-based section. I then introduced a series of fast single note runs, followed by several more arpeggiated patterns before the main lead guitar solo starts at 3.27 over a IV-V-IV-V chord pattern. The section concludes with a figure in 7/8.

Finally, there is a return to thematic material from the beginning, followed by a call and response between the two parts consisting of natural harmonics, behind the nut bends and chordal tremolos played with fingernails. There is a Stanley Jordan-inspired tapping section between the two parts to conclude the piece alongside the final few trills and chords.

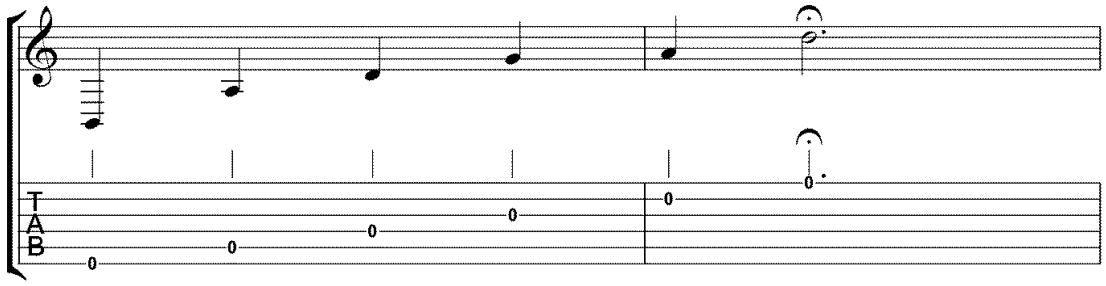
Summary of Findings

After evaluating this piece, I decided to focus on musical material which was more representative of the tuning itself and avoid generic guitar sounds such as arpeggios and fills that sounded too similar to standard tuning. I also decided to focus on exploring fewer textures in greater depth.

The next two pieces in the portfolio focused on the use of BADGAD and BbADGAD tunings. Both of these were still derived from DADGAD but used a B and Bb in the bass respectively.

Composition 3: *Not That That Helps* (BADGAD)

Figure 12:



B – dropped low E string down a perfect fourth

A – no change

D – no change

G – no change

A – dropped B string a down a tone

D – dropped top E string down a tone

This improvisation is based on the previous tuning C#ADGAD, only the bass string has been lowered by a tone, resulting in BADGAD. This improvisation explores more angular musical textures and focuses again on the interplay between the three improvised guitar parts, using ideas which focus on demonstrating the effects of the specific tuning.

Guitar 1 introduces a natural harmonic riff quite forcibly. Guitar 2 plays higher harmonics with delay over the top. Guitar 3 can be heard quietly playing open strings and parallel harmony shapes. At 1.10, the bass line of guitar 1 breaks away from the main riff momentarily and there is a call and response interplay between guitar 1 and 2 using a series of trills, string bends, volume swells and harmonics. From 1.27, guitar 3 introduces a high pitched tremolo part which provides a background texture for the remainder of the piece, played using fingernail and knuckle which subtly varies throughout. Guitar 1 briefly re-instates the initial opening riff before transitioning into a heavy metal inspired riff using the bottom three strings. Guitar 2 adds a series of open strings and harmonics, interjecting with another open string riff throughout. At

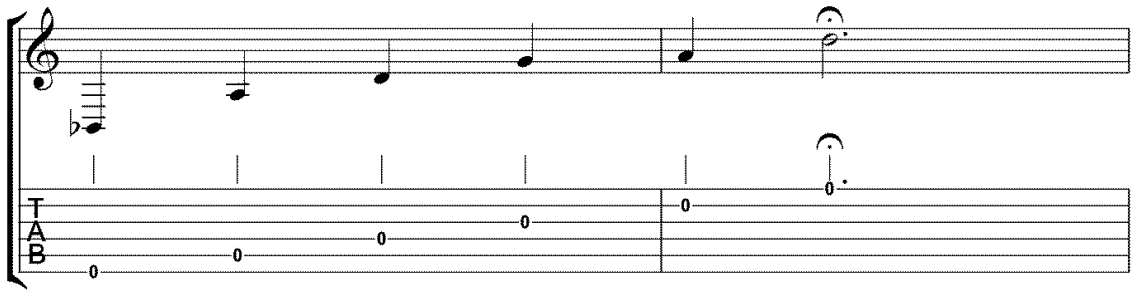
3.06, there is a further reinstatement of the opening riff before returning to the previous main riff. However, this time Guitar 2 improvises a one string melody over the top while guitar 3 continues to provide the shimmering texture.

At 4.30, there is another breakdown leading to a call and response interplay between guitar 1 and 2. Based on previous thematic material but also new techniques such as the triad string bends at 5.05, 5.09, 5.17, 5.18 and 5.20 and fast tremolo from 5.23-6.14. The heavy metal riff is later reprised, proceeded by **a** series of stops played by guitar 1 and 2. These become gradually more frequent until the metal riff is reprised at 6.13. From 6.36 – 9.14, there is a more conventional chord-solo section. Guitar 1 reinstates the main riff at 8.36.

Finally, we return to the strummed stop riff from earlier, though this time as a call and response between guitar 1 and 2 rather than in unison. From 9.30, the piece concludes with a few chordal and open string phrases and a detuning of the bass string I played in real time. Guitar 3 fades out with increased use of a flanger into subliminal noise.

Composition 4: *Valentine Fog Clears* (BbADGAD)

Figure 13:



Bb – dropped low E string down a diminished fifth

A – no change

D – no change

G – no change

A – dropped B string down a tone

D – dropped top E string down a tone

For this piece, all three of the improvised guitar parts were completely live recordings with no edits, reacting to one another in real-time. This led the piece to evolve more organically to the previous, which was edited considerably. There was a significant degree of production carried out on each of the three parts so they would sonically work together within the track. I have given an overview of each below:

(I) **Guitar 1:** This was a bass part improvising around the open low Bb string. The low-mid frequencies were taken out to help maximise headroom and volume within the track. This was then re-enhanced with a plug-in which simulated the overtones of a low frequency part to give the track greater breadth and volume in a more balanced way. A fuzz pedal plug-in was later added to this part which can be heard throughout the recording. This part was also centred in the panning of the mix.

(II) **Guitar 2:** This was a mid-range part using mainly natural harmonics and open strings. For the recording we used chorus, delay and panned the part in stereo left and right.

(III) **Guitar 3:** This part used just the upper strings of the new tuning and was based on more single line improvised ideas. Again, it was panned left and right more harshly to maximise separation and used a stereo spreader plug-in to help the part integrate into the mix.

Between 0.00-2.40, guitar 1 plays a pedal on the open bass Bb string, followed by other open strings/natural harmonics on guitar 2 and a series of high trills and fast passages on guitar 3. This dynamically increases before transitioning into a more rhythmical section.

From 2.40, the three parts then go into a latin-feel which slowly evolve throughout the remainder of the piece. Guitar 2 introduces a new idea using the open strings over the bass line which breaks away periodically to a more tremolo-based part. From 5.45,

guitar 1 and 2 begin to improvise using parallel harmony shapes in a call and response style. The track begins a slow dimuendo from around 6.45 until the finish at 8.06.

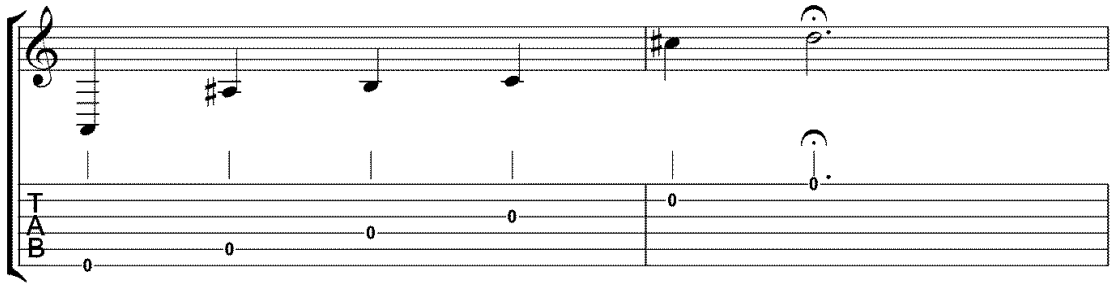
Summary of Findings

Although I was now achieving some interesting timbral sounds with the tunings, the thematic development of these earlier pieces was still quite underdeveloped. There was a surplus of musical ideas that were not evolving and as a consequence, these recordings lacked the structural integrity of a fully developed composition.

However, I did find that these pieces served as an essential preliminary experiment that allowed me to become more comfortable with detuning the guitar and working in a less contrived, intuitive way. These experiments also allowed me to begin to see the potential of improvising with alternate tunings and establish a working method which I continued to refine. Moving forward, I started approaching the improvisations from a more minimalist-perspective with the ideas evolving more gradually over time.

Composition 5: *Chinese Whispers* (AA#BCC#D)

Figure 14:



With chromatic tuning, the distinct sound of the chromatic scale is evident in the open strings and parallel harmonies created from barring one fret. A slight rattle on the low A can also be sometimes heard, particularly when played forcibly. There is an intervallic gap of a flat ninth between the sixth and fifth strings and third and second strings where the octave had to be displaced. The third string is particularly slackened within this tuning, down a fifth from G to C. The sonority of this piece is comparable to Bartok's *The Night's Music* from his collection of five piano pieces *Out of Doors* (1926).

This tuning is extremely unusual and represented a significant departure from my previous efforts. From my existing research, I had found no application of regular chromatic tuning (this means where the open string intervals ascend in semi-tones like a chromatic scale). According to Sethares (2011), this seemed to be largely due to practical difficulties however I would also argue from my own experimentation that musical aesthetics could play a role as this choice of tuning is very dissonant on first hearing.

For this piece, I chose to focus on three specific musical ideas which I thought would produce a sound most representative of the tuning. I assigned each idea to a different guitar part:

(I) Guitar 1: Improvisation using the bass string only; this part was recorded using the neck pickup and played with thumb for a softer walking double bass sound.

(II) Guitar 2: Improvisation using open strings and harmonics; this part was played with a pick using the middle pick up for a brighter jangly tone.

(III) Guitar 3: Improvisation using the top two strings; this part used a combination of pick and fingernails on the bridge pick up to create a shimmering, percussion texture throughout the piece.

My findings showed that the sound of the tuning became more exposed due to this greater presence of open strings, natural harmonics and the bass string drone. These three ideas also worked well together as each occupied a different frequency (low/mid/upper). In the subsequent pieces, I used a similar polyphonic working method of multi-tracking guitar parts as it helped to create more coherent, broad soundscapes that would not have been possible with a single guitar track. This helped to demonstrate the wide variety of sounds and textures that could be derived from the tunings as well as providing the opportunity for an improvised call and response dialogue between the parts. Different production techniques were also applied to each part separately as well as to the whole mix.

I wanted to explore what results could be generated, if any, from this very mysterious tuning that seemed to have alluded guitarists. Due to practical reasons, strictly correct

chromatic tuning is not really possible on a standard guitar due to the change of string interval required would simply break the string due to a huge increase in tension. It could also risk damage to the guitar neck too. However, I discovered I could preserve three out of five of the chromatic intervals if I was prepared to drop the octave register on the other two strings. The lowest I could audibly and accessibly perform on the low string was an A so I worked with this key for the piece. I have indicated in brackets for each of the following tunings what the exact interval was and whether I had to alter the octave register. This tuning was as follows:

A – dropped low E string down a fifth

A# – sharpened A string up a semi-tone **(flat 9th higher)**

B – dropped D string a minor third **(flat 2nd higher)**

C – dropped G string a fifth **(flat 2nd higher)**

C# – sharpened B string up a tone **(flat 9th higher)**

D – dropped top E string down a tone **(flat 2nd higher)**

As can be seen, this tuning required considerable movement of the strings to achieve but in doing so arrived at a result fairly close to 'purely' chromatic tuning. As I highlighted in my methodology, it also is important to reiterate that the practice of displacing the octave register in this manner is commonplace in Nashville tuning.

This tuning (A Chromatic) has a number of idiosyncrasies. Firstly, the low A string in itself is unusual as it is about as low as the conventional sixth string E on the guitar can go before it becomes unplayable. At this pitch, there is audible rattle when the string is played hard. Also, intonation can be an issue so a lighter touch and tuning the string marginally flat can help I found (a technique inspired by James Taylor I previously discussed in chapter 3). The third string G is also lowered by a fifth to C which is particularly unusual in this context because it is followed by an open C# string over an octave higher. The open strings spell out an extremely dissonant sound, as do any related parallel harmony shapes, familiar chord shapes, harmonics and single note lines that involve more than one string.

Consequentially, this tuning took quite a while to develop familiarity with. However, structuring the composition into three guitar parts allowed me have one part that used just the low string, one that used very dissonant harmonies from the middle strings and an upper part that focused on creating a texture by repeating and developing ideas on the top two strings. The original recording was around 9:30 in duration which was edited down to around 5:30 to maximise musical impact.

Between 0.00-0.24, Guitars 1-3 play a series of overlapping natural harmonics, introducing the sound of the tuning. From 0.25-1.25, Guitar 1 begins a jazz swing style bass line. Guitar 3 complements this by playing a repetitive quaver pattern on the top two strings. Guitar 2 plays a series of open string-based and dissonant interval fills. From 1.25, there is a dimuendo and the three parts break down into a more rubato feel. There is a strong interplay between all three parts using dissonant fills and harmonics in a call and response style. Next, Guitar 1 returns to bass line, guitar 2 plays a repetitive organ-inspired riff, guitar 3 returns to its original motif with considerable variation using open strings and dissonance. At 3.27, Guitar 3 introduces a new idea, producing a sound vaguely reminiscent to a Japanese shamisen. Finally, guitar 1 and 3 go into free time again and improvise in a call and response way with each other. Guitar 2 maintains the same rhythmical figure until the end.

Composition 6: *Chromatic Attack* (AA#BCC#D)

Following the more intriguing results of the previous piece, I chose to develop working with this tuning further. For this second piece in chromatic tuning, I adopted a new type of string due to the need to accommodate the low A on the guitar which can be challenging to intonate. Flatwound guitar strings offer a much more mellow tone than nickel wound guitar strings which can be very bright. The flatwound string tone is also smoother and fret and finger noise is mitigated considerably as well as being physically softer to play.

Guitar 2 and 3 begin with an interplay of natural harmonics, dyadic fills and triple stop bends. Between 2.17-2.57, Guitar 1 then enters with a drone bass line while guitar 3 plays a couple of long sustained chords before both transition into a series of loud trills. Guitar 2 continues with a mix of chords, harmonics and open strings. From 2.58-

3.37, Guitar 3 alternates between two arpeggios, guitar 2 plays a repetitive harmonic phrase, guitar 1 plays an open string and harmonic phrase on the bass string. After 3.38, Guitar 1 vamps out on with a tremolo played on the bass string while guitar 2 imitates an African- inspired guitar part on the middle strings and guitar 3 plays a final series of trills in the upper register.

Summary of Findings

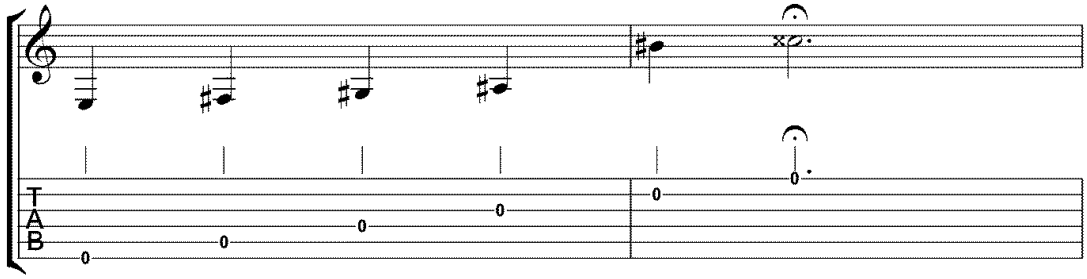
These two pieces in chromatic tuning demonstrated a guitar sound different to any other experiments I had previously tried. This seemed to be due to the extreme intervallic relationships and timbres of the guitar strings. In addition, my working method of multi-tracking guitar parts within the respective tuning had become more established by this stage. As a consequence on this last piece, 'Chromatic Attack', the three guitar parts sound more intertwined with one another which I think is evident from the recording. This made the transcription inevitably more challenging so I had to be a little more selective with what material I focused to notate.

Composition 7: *Babylon Bells* (AA#BCC#D)

This short piece is an edited version of 'Chromatic Attack' using studio editing and loops as a basis for producing a more minimalist, succinct style of composition. While this experiment did produce a very clear musical result, it lacked the musical interaction of the three improvised parts that had previously become a staple part of my working method. Therefore, I chose not to pursue this approach any further however I did use this recording as a structural template for my subsequent improvisations by ensuring I used fewer ideas and developed them in more detail. In this sense, this piece represents a pivotal moment in the portfolio where the working method and musical aesthetic became much more refined. This is why the latter half of the portfolio from this point represent finished compositions rather than the more experimental nature of the earlier half of the portfolio which was structured more as a montage of musical ideas. From this point on, I used fewer contrasting ideas and also began working exclusively with a click track and tempo marking which I had not done previously as I wanted to keep the improvisation open.

Composition 8: *Surf-Dale* (Whole-tone tuning EF#G#A#CD)

Figure 15:



Again, regular whole-tone tuning's distinct character is immediately apparent in the open strings. The only exception to the octave register with this tuning is between the third and second strings where there is an intervallic gap of a ninth. This tuning also involved sharpening the second string a semitone to achieve this as slackening the string to the same note caused it to become unplayable. My title, 'Surf-Dale' for this piece is a reference to guitarist Dick Dale who pioneered the American Surf guitar movement of the 1960s and inspired some of the single line and open string ideas I used here.

To achieve this tuning, I worked from standard E and kept the bass string the same:

E –no change

F# – dropped A string a minor third **(2nd higher)**

G# – dropped D string a diminished fifth **(2nd higher)**

A# – dropped G string a fifth **(2nd higher)**

C – sharpened B string up a tone **(9th higher)**

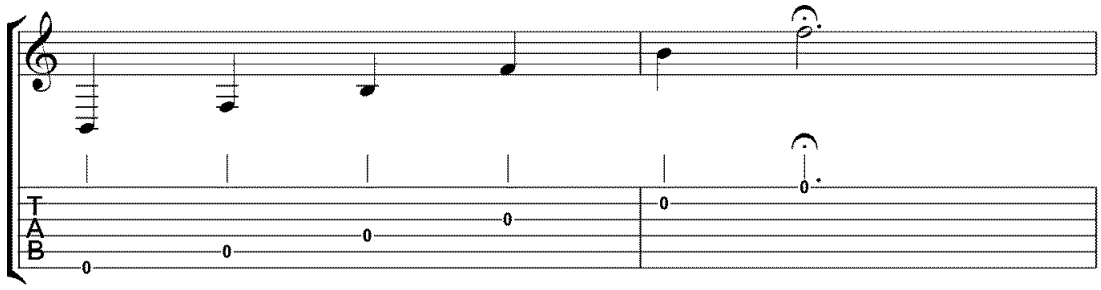
D – dropped top E string down a tone **(2nd higher)**

From my findings, I found whole-tone tuning perhaps produced the most novel sound of all. This can be heard in the opening harmonics between the three parts. The section builds with some additional tremolo string playing in the upper guitar part. The improvisation goes through a pulsating change in dynamic range throughout. A series

of fourth fret harmonics and behind the nut also bends proceed from 2.52. From 4.35, single note textures become more prominent. The piece dimuendos before introducing earler thematic material from the start at around 6.00. From 7.42 a more rhythmic figure using natural harmonics begins. The other two parts improvise similar figures around this in a canon style until rall at the end.

Composition 9: *Kotofuzz* (Tritone tuning BFBFBF)

Figure 16:



Regular tritone BFBFBF: This tuning involved less extreme tuning movements to achieve and unusually, is the only regular tuning that involved no octave transposition. The top E string was raised a semitone to an F which added a brighter tone to the upper register of the tuning.

B – dropped low E string down a fourth

F – dropped A string down a minor third **(flat 5th higher)**

B – dropped D string a minor third **(flat 5th higher)**

F – dropped G string a second **(flat 5th higher)**

B – no change **(flat 5th higher)**

F – sharpened top E string up a semi-tone **(flat 5th higher)**

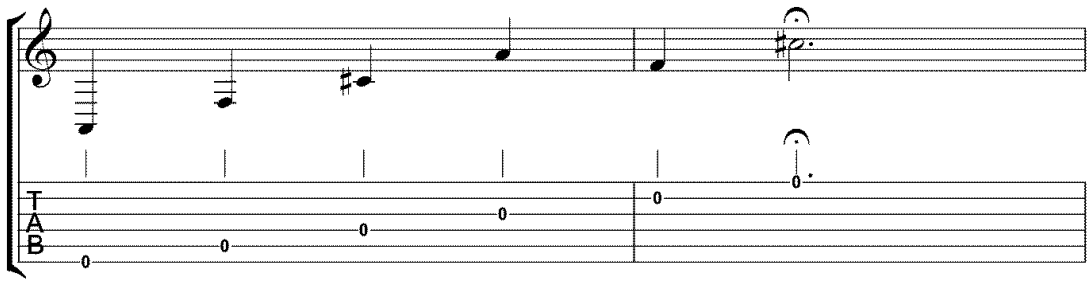
This is a much shorter composition that develops the use of fourth fret natural harmonics and behind the nut bends from the previous piece. The feel I employed though is generally harsher on the strings. There is a greater sense of space and use of the volume swells in this piece, as well as slightly more break-up from the amplifier.

The greater range of harmonics makes for a more musically engaging interplay between the guitar parts.

Due to the wider intervallic ranges of regular sixth and seventh tunings, it became much more challenging to preserve the octave register of each string as the standard guitar can simply not accommodate this range. While changing the sting can of course have some impact on attempting to resolve this issue, it poses great risk to damaging the guitar due to the increase in string tension being exerted on the guitar neck. The guitar would therefore require a set up change for every new tuning examined making this option largely impractical. Therefore, I began to explore alternative practical solutions which focused on displacing the octave register where the exact interval could not be attained. While this practice may seem slightly at odds with exploring regular tunings like these it is important to recognise that this is a common practice within Nashville tunings which give them such a revered idiosyncratic sound. I was also able to minimise the extent to which I displaced the octave of a string in a particular tuning too by ensuring that I maximised the full pitch range of the guitar by tuning the low E as low as possible (down to a low A usually), thus mitigating this issue.

Composition 10: *Augmented Realism* (Regular minor sixths AFC#AFC#)

Figure 17:



A – dropped low E string down a fifth

F – dropped A string down a major third **(minor 6th higher)**

C# – dropped D string a minor second **(minor 6th higher)**

A – sharpened G string a second **(minor 6th higher)**

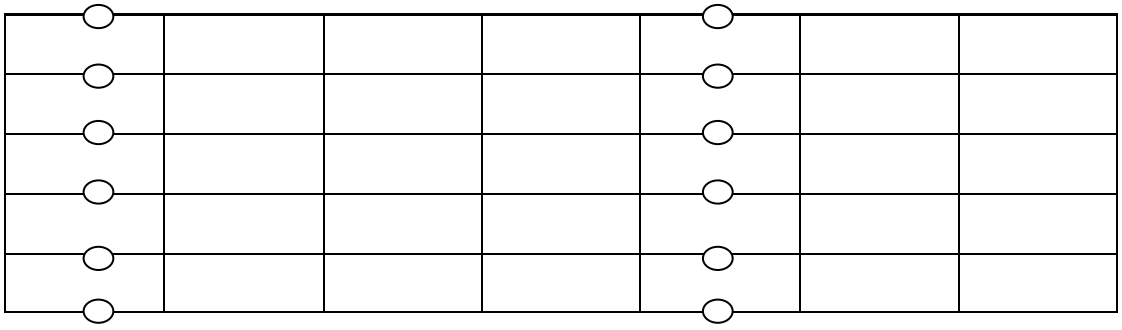
F – dropped B string down a diminished fifth **(major 3rd lower)**

C# – dropped top E string down a minor third **(minor 6th higher)**

My exploration of this tuning created a type of compound major thirds sound, giving the tuning an augmented sonority (comparable to Ralph Patt's major third tuning analysed earlier). This tuning also involved fairly excessive string movements to the sixth and second strings in particular as well as raising the third string a tone from G to A, a practice I generally tried to avoid in order to mitigate the level of tension being exerted on the guitar neck.

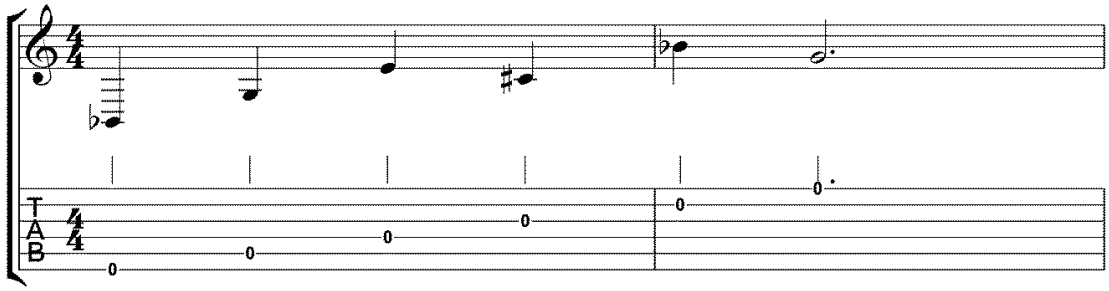
For this improvisation I tried to avoid dependence on the natural harmonics used previously to see if this would inspire to develop alternative approaches. The main feature of this piece therefore is a call and response between two fast single line guitar parts playing application of the augmented scale, which I discovered work particularly well in this tuning. This was the basic pattern I used:

Figure 18:



Guitar 1 plays a soft chordal part using a slow delay. The piece ends with a more abrupt stop after the final single line phrase.

Composition 11: *Volcanic Waltz* (Regular major sixths BbGEC#BbG)



Bb – dropped low E string down a diminished fifth

G – dropped A string down a major second **(major 6th higher)**

E – sharpened D string up a tone **(major 6th higher)**

C# – dropped G string down a diminished fifth **(minor 3rd lower)**

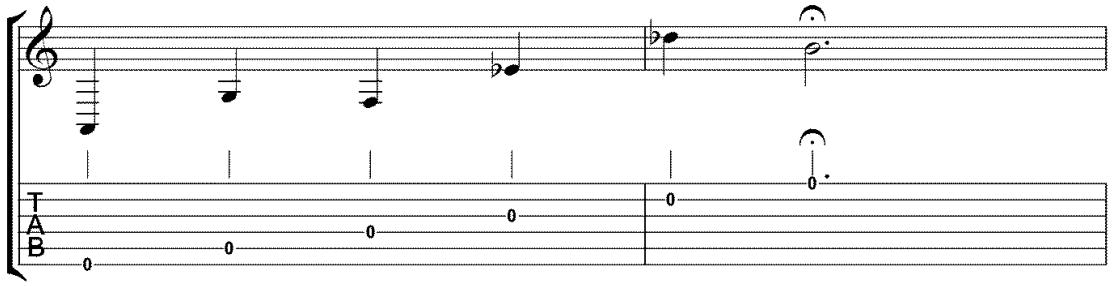
Bb – dropped B string down a semitone **(major 6th higher)**

G – dropped E string down a major sixth **(major 6th higher)**

Whereas the previous tuning was comparable to open augmented chord, this tuning produces an open diminished chord. For this piece I wanted to experiment with working with a click track in 3/4 time, hence the waltz rhythm throughout the track. There is a change between 2.10-2.55 where there is an improvised exchange between two of the parts before the rhythm is re-instated. This happens again between 3.38 – 4.49 with harmonics. The general theme is inspired by Hawaiian slide guitar music so makes extensive use of slides, glissandos and chromaticism.

Composition 12: *Night Train to Mumbai* (Regular minor sevenths AGFEbDbB)

Figure 20:



A – dropped low E string down a fifth

G – dropped A string down a major second **(minor 7th higher)**

F – dropped D string down a major sixth **(major 2nd lower)**

Eb – dropped G string down a major third **(minor 7th higher)**

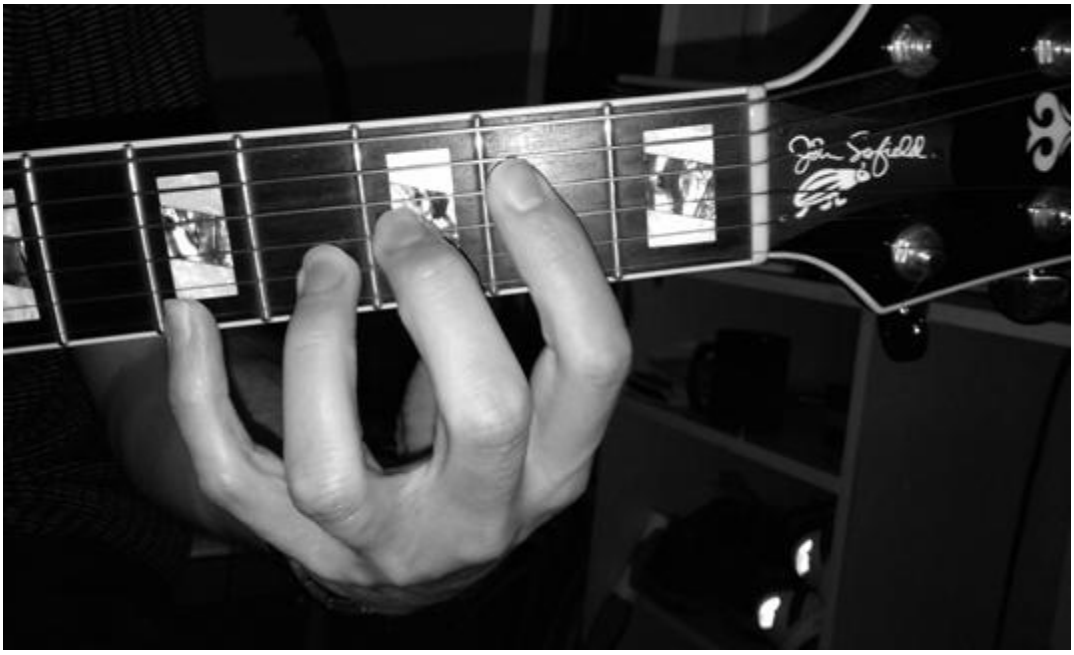
Db – sharpened B string up a major second **(minor 7th higher)**

B – dropped top E string down a fifth **(major 2nd lower)**

The most unusual aspect to this tuning was the extreme dropping of the fourth string from a D down a major sixth to an F and the first string E down a fifth to B. The slackened third string from a G down a major third to Eb also gives the tuning a sitar-esque sound which can be heard on the recording.

This piece focuses more on timbre than chord voicings. Perhaps the most unusual aspect being the detuning of the top E string down a fifth to B. If anything, the chordal progression is more regular in nature here. However, the use of single note melody playing is particularly unusual. The open slack strings and hammer-ons give the guitar a sitar-esque sound and I also found an unusual approach to playing unision/octave melodies in this tuning which can be heard from 1.35 – 2.30. The following photo demonstrates the shape I used:

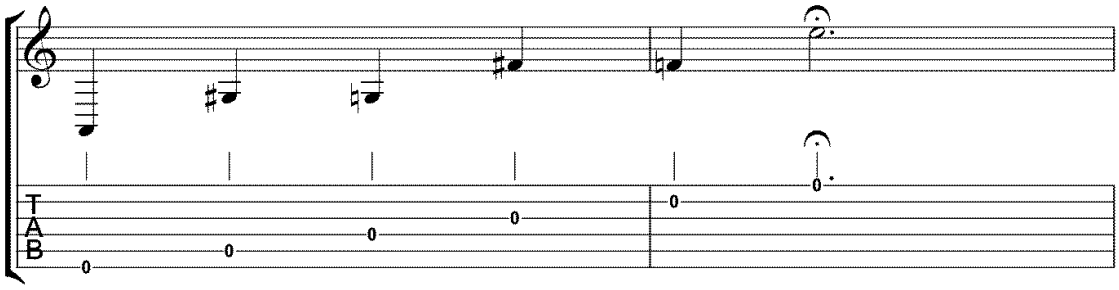
Figure 21



Further harmonics and behind the nut bends follow where there is a brief departure from the main chord progression which returns at 3.46 with a cross-rhythmic figure played over the top. From 4.13 we enter the final outro section which is lead by guitar 1 playing the bass part. Guitar 2 plays an Andy Summers-inspired straight eighth palm-muted part while guitar 3 continues the cross-rhythmic figure. Guitar 1 and 2 drop out leaving guitar 3 which concludes with another reference to the bass figure from 4.13.

Composition 13: *All's Swell, Ends Swell* (Regular major sevenths AG#GF#FE)

Figure 22:



A – dropped low E string down a fifth

G# – dropped A string down a minor second **(major 7th higher)**

G – dropped D string down a fifth **(minor 2nd lower)**

F# – dropped G string down a minor second **(major 7th higher)**

F – dropped B string down a diminished fifth **(major 7th higher)**

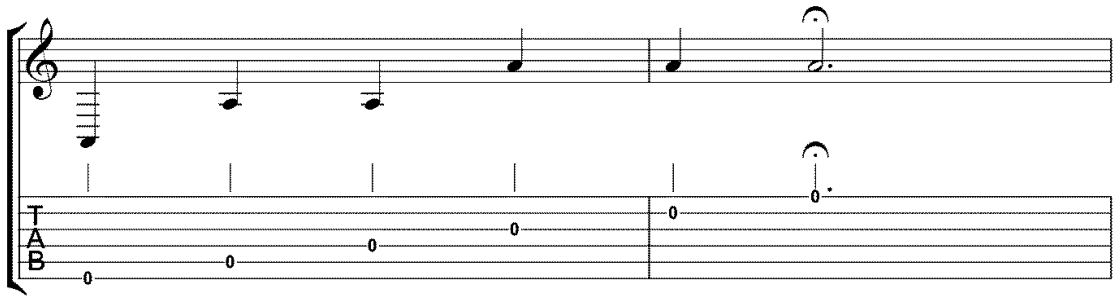
E – no change **(major 7th higher)**

With this tuning I was able to preserve three of the major seventh intervals but displaced the octave twice where it became necessary (between the fifth to fourth and third to second strings where the interval is a descending semitone). The use of volume swells and multi-tracking guitar textures in this way is comparable to some of Bill Frisell's style.

During the initial fade-in, we begin to hear the very distinctive character of the tuning. Guitar 1 introduces the bass part from 0.22. Again, there is great emphasis here on timbre and interplay while trying to leave plenty of space between the parts. A new section begins at 1.27 using a Im-Vm-IVm type of chord progression in guitar 1 while the other parts improvise with a mix of three note string bends, triads and volume swells. This becomes more pronounced between 3.00 – 4.00 where the whole section is played by three guitars all using volume swells and demonstrates a sound not yet explored within the portfolio. This is followed by a re-instatement of previous material with a more rubato feel. The final volume swell ideas draws the track to a close.

Composition 14: *Twelve Constellations* (Unison/Octave tuning in all twelve keys)

Figure 23:



My initial solo studies focused on writing specific studies for one guitar. My subsequent improvisations focused on the range of different textures that could be derived from multi-layering 2-3 guitar tracks. For my final summative piece, I wanted

to explore arranging for a larger number of guitars. Therefore, with unison/octave tuning I decided to try using twelve guitar tracks each tuned to a different note of the chromatic scale. On listening back to the portfolio retrospectively, it is perhaps surprising how tonally (though not so much sonically) how uniform this recording sounds. Overall, I found this actually created a more cyclical structure to the portfolio, which begins with a relatively consonant set of solo studies before moving into a more dissonant set of improvisations and finally concluding with a return to a more harmononious sound.

I was fascinated by the idea of including a piece that used multi-tracked guitars each tuned to a different note in unison/octave tuning to see what the effects would be. As my portfolio has largely focused on regular tunings, finishing with an exploration of unison/octave tuning seemed a logical point to conclude.

In attaining the unison tuning for each of the twelve tracks, I followed the practice outlined in each of the previous overviews of tuning down most of the time unless it was possible to reach the desired pitch by tuning up no more than a tone.

Summary of Findings

Following my analysis of the existing literature in chapter 2 and the methodology set out in chapter 3, this chapter examined the process I took to addressing my research questions and implementing my methodology. On listening back to the whole portfolio, there is a clear distinction between the different tunings, yet a sonic consistency throughout. I would argue this is as the intervallic relationship between the strings are substantially different each time. The range of alternative harmonies and timbres I was able to extract from these tunings is also apparent throughout the recordings.

The progress of my work is also evident throughout the portfolio, which start as short studies, then develop through a series of initial improvisations before transitioning into a more solid collection of pieces which have a stronger sense of thematic development. In the following chapter, I will provide an overall conclusion to my

findings and assess how effectively I was able to address each of my research questions.

I found In some cases my exploration of a fairly dissonant tuning would yield a relatively consonant result depending on the chord shape or pattern I chose to use. Such examples include the 13#9 voicing shape I used in *Night Train to Mumbai*, which produced a completely unison sound with each string sounding the same note with a different inharmonicity. This is outlined in my directory, diagram number 18. Another particular example was diagram number 22 in the directory which I also experimented with in chromatic tuning, producing a straight Dmaj7 voicing.

It is important to recognise this portfolio not only as an exploration of alternate tunings but of the guitar techniques employed to perform with these tunings. I had to adjust my own approach to technique throughout, in particular when executing the solo studies which I have detailed in my directory of muscle memory shapes/patterns. Here I illustrate particular fingerings used, whether I used a pick, finger and whether the motion was an upstroke, downstroke or both.

Although this research focuses largely on the left-hand finger positioning, it can also be seen I did employ a number of right hand techniques as a means of accurately executing the notes and exploring different timbres within the tunings. These techniques also included use of right fingernails to brush the chords (a comparable technique to Wes Montgomery's octave playing only with the first and second fingernails), playing with a pick over the neck pick up to achieve a more harp-like tone, playing near the bridge to achieve a more jagged tone, sweep picking (where a phrase is executed through one fast motion through the strings with the right hand), alternate picking (combining up and down strokes consecutively), snapping behind the string with my right thumb rather than using a pick for a greater bluesy attack as well as the use of right hand volume swells, controlled solely by the volume controls of the guitar. This is something I prefer to use my right hand rather than a foot pedal for as it gives me a greater level of finite control of how I want the swell to sound.

Chapter 5 – Conclusion and Suggestions for Future Research

The creation of new knowledge from my research focuses on the two following areas:

5.1 Alternate tunings – the development of new harmonic/textural/timbral ideas for the guitar and historical analysis.

My research findings have highlighted the development of new harmonies, textures and timbres from the exploration of unorthodox guitar tunings in addition to providing some historical analysis of alternate tunings not covered within the existing literature.

My research established several unorthodox regular tunings that were not being explored in the current literature. These were: Regular chromatic, whole-tone, tritone, major/minor sixth, major/minor seventh and unison/octave and I based each improvised piece within the portfolio on exploring one of these tunings. I found the most novel sounding results came from the tunings with close intervals (such as the chromatic and whole tone tunings) in addition to the tritone tuning. These offered the most scope for exploring innovative textures and sounds while the wider interval tunings had a more angular sonority.

In most cases, I found the more I spent time with each tuning, the more I was surprised at how much material I could derive from it. During the recording sessions, I found it would typically take me around 10-20 minutes to become fully mentally absorbed in the process of improvising with the tuning before I was in a state of mind to fully embrace the new sound. Invariably, it was an uncomfortable process to begin with. It is important to reiterate I was careful not to over prepare with the tuning prior to the recording session as I wanted to capture the element of spontaneity on the record.

I also discovered an enormous range of timbres that went beyond the realm of what we might categorise as typical guitarisms. Rather, these were more like a series of metallic tones, comparable to tuned metal percussion sounds. These findings were significant because my original research objective had been to explore these tunings to see what new harmonic, textural and timbral sounds could be derived from the guitar as a consequence, which I think the portfolio reflects. The variety of string gauges and

studio processing tools also enabled me to maximise the different tonal possibilities too.

On reflection, I would have liked to have had more studio time to produce the recordings but time was restricted. Nonetheless, I maintained an efficient recording schedule across 15-20 studio sessions. Approximately two thirds of the session time focused on essential mixing and editing with the remaining time being the actual tracking itself. More time would have also enabled me to get to know each tuning in more detail and possibly discover further sounds and applications. However, I was satisfied with the overall recording quality.

Suggestions for future research

Looking ahead, there are a number of suggestions I would make for future research:

- Publish my findings on unorthodox regular tunings, discussing in further detail the practical applications of each tuning and develop new recordings
- Produce a series of either further studies or compositions that could be designed to be recreated live. As much of my improvisation style uses multi-layered parts to create the sound on these recordings, the pieces could be written for several guitarists, for instance. The compositions could also explore shorter durations and different types of musical form.
- Explore making a DVD/series of videos which discuss the tunings and help to disseminate my findings more widely.
- Look at multimedia collaborations such as incorporating visuals with the recordings.
- Conduct a substantial body of research which explores how each different string gauge and type responds to different alternate guitar tunings. This idea poses a number of issues around guitar set up and would likely need to involve several guitars to help mitigate any potential problems in having to make significant set up changes to a guitar. For example, it may be more suitable to explore heavier gauges such as baritone strings on a guitar that is already set up with gauge 13s rather than 9s! This research could then be used to advise players on building customised sets of strings for specific tunings.

- Make a commercial music album based on compositions which use these tunings.

5.2 Muscle memory practice in guitar – an alternative method to circumvent over-dependence on muscle memory.

My findings have highlighted the extent to which muscle memory dependence exists among guitarists in particular. In addition, while some of the sources address the ongoing issues around how to practice muscle memory techniques most effectively, this is still an area of debate which I believe my research makes some contribution to furthering.

From my own teaching, I have found that when a guitarist expresses frustration about being over-dependent on a particular pattern for improvising or composing, it is the sound of those patterns they are taking issue with rather than the actual physical shape itself. This is a popular misconception but understanding this is central to how my own research contributes to this debate.

I have discovered the application of alternate tunings can impact this over-dependence on muscle memory enormously as well as offering new musical timbres and textures which challenge the limitations of what the guitar is capable of sounding like. Rather than the player having to therefore change the muscle memory shapes to produce new results, they can change the tuning to generate a wealth of new harmonic, melodic and timbral sounds without having to change any of the muscle memory shapes. Of course, the player is always free to do this too. I believe this research therefore contributes new knowledge to an existing debate about how to find new ways to circumvent the problem of over-dependence on muscle memory.

By developing a compositional method which prioritises body movements over the mind rather than the mind over the body movements, I am proposing an alternative model of composition which draws on using a different sensory approach. Because I did not know what each new tuning was going to sound like, I was forced to compose using visual patterns and shapes as my primary frame of reference (see **Appendix II**).

It is important to recognise that while my research clearly advocates such muscle memory use, it is not opposed to the use of explicit memory. I also recognise that there is a lack of literature which addresses using explicit memory to improvise with and it is important therefore not to see these two approaches as being completely in opposition to each other.

This research has also helped to broaden my general musical outlook as it has underscored for me the importance of continually exploring new musical resources to be creative with in order to develop a vigorous musical voice. More recently, I have been working with a number of guitarisms including: different ways of swelling the volume knobs on the guitar for single lines, chords both in jazz soloing and comping, using a range of finger tapping techniques and exploring harmonising simple lines with wide intervals such as sevenths (this makes an interesting alternate to the classic octave sound).

Suggestions for future research

- Write a larger scale series of works that are based on muscle memory use rather than an aural aesthetic. This could involve using any alternate tuning or could even apply as a standalone approach to working in standard tuning.

- In developing this idea further, the use of tablature and fretboard diagrams like those contained in the appendices could prove valuable scoring tools for future work. The next step would be to compose a larger scale piece that is written in guitar tablature that focuses purely on visual muscle movements and not on the sounds produced, the challenge being to not be influenced by the aural aspect at all. This could also work well as a potential collaborative composition as similar approaches could theoretically be taken by other disciplines. For example, a choreographer could produce a dance based on the aural sounds produced rather than by the visual movements.

Bibliography

Alternate Tunings for Guitar (and general guitar sources)

Coelho, V.A. (Ed.) (2003). *The Cambridge companion to the guitar.* Cambridge, Cambridge University Press.

Grenzelos, L. (2017). *Scordatura.* Hamburg, Tredition.

Grossman, S. (2017). *Stefan Grossman's early masters of American blues guitar: country blues guitar.* Van Nuys, Alfred Music.

Hanson, M. (1995). *The complete book of alternate tunings.* West Linn, Accent on Music.

Harper, C. (2006). 2nd Ed. *Dazzling stranger Bert Jansch and the British folk and blues revival.* London, Bloomsbury Publishing Ltd.

Johnson, C. (2002). *Alternate tuning chord dictionary: A complete reference to over 7,000 Chords.* Milwaukee, Hal Leonard.

Tyler, J. & Sparks, P. (2007). *The guitar and Its music from the Renaissance to the Classical era.* Oxford, New York. Oxford University Press.

Tyler, J. (1980). *The early guitar: a history and handbook.* London, Oxford University Press.

Online Resources

Aloni, O. (Producer). (2013). *Stanley Jordan on p4 guitar tuning*. [Video Online] Available at: <http://www.youtube.com/watch?v=WcHid5cucLo> [Accessed 18 October 2014].

Anerton, C. (2012). *The alternative to alternate tunings.* [Online] *Guitar Player*, 46:8, p. 148. Available at: <http://go.galegroup.com.salford.idm.oclc.org/ps/i.do?&id=GALE|A295324571&v=2.1&u=salcal2&it=r&p=ITOF&sw=w> [Accessed 28 October 2017].

Anon. (2014). *Are you heavily Influenced by horn players?* [Online] Available at: <https://www.jazzguitar.be/forum/improvisation/37054-you-heavily-influenced-horn-players.html> [Accessed 08 September 2018].

Anon, (2017). *How to choose the right strings for your electric guitar.* [Online] Available at: <https://thehub.musiciansfriend.com/guitar-buying-guides/how-to-choose-the-right-strings-for-your-electric-guitar> [Accessed 16 September 2018].

Anon, (2001). *Slack-key guitar.* [Online] Grove Music Online. Available at: <http://www.oxfordmusiconline.com.salford.idm.oclc.org/subscriber/article/grove/music/52604> [Accessed 28 October 2017].

Anon, (2001). *Open tuning.* [Online] Grove Music Online. Available at: <http://www.oxfordmusiconline.com.salford.idm.oclc.org/subscriber/article/grove/music/51243> [Accessed 30 October 2017].

Anon, (2003). Jim Campilongo on guitar -- behind-the-nut bends. [Online] *GIG,* p. 12. Available at: <http://go.galegroup.com.salford.idm.oclc.org/ps/i.do?&id=GALE|A103599249&v=2.1&u=salcal2&it=r&p=ITOF&sw=w> [Accessed 28 October 2017].

Anon, (2003). Jim Campilongo on guitar part II -- detuning tricks. [Online] *GIG,* p. 11. Available at: <http://go.galegroup.com.salford.idm.oclc.org/ps/i.do?&id=GALE|A98271968&v=2.1&u=salcal2&it=r&p=ITOF&sw=w> [Accessed 28 October 2017].

Anon, (2007). Timara string drop for alternate tunings: dillon guitar. [Online] *Music Trades,* 155:9, p173. Available at: <http://go.galegroup.com.salford.idm.oclc.org/ps/i.do?&id=GALE|A169923771&v=2.1&u=salcal2&it=r&p=AONE&sw=w&authCount=1> [Accessed 28 October 2017].

Anon, (2011). Fret-King's self-tuning guitar. [Online] *JAZZed,* 6:2, p. 58. Available at: <http://go.galegroup.com.salford.idm.oclc.org/ps/i.do?&id=GALE|A301774545&v=2.1&u=salcal2&it=r&p=ITOF&sw=w> [Accessed 28 October 2017].

Davis, M. (2014). Favorite tuning/intonation correction system? [Online] *Guitar Player,* 48:2, p. 16. Available at: <http://go.galegroup.com.salford.idm.oclc.org/ps/i.do?&id=GALE|A357591181&v=2.1&u=salcal2&it=r&p=ITOF&sw=w> [Accessed 30 October 2017].

Boyden, D.D. et al. (2001). *Scordatura.* [Online] Grove Music Online. Available at: <http://www.oxfordmusiconline.com.salford.idm.oclc.org/subscriber/article/grove/music/41698> [Accessed 30 October 2017].

Campilongo, J. 2003. *Jim Campilongo on guitar part II – detuning tricks* [Online] Available at: <http://go.galegroup.com/ps/i.do?p=ITOF&u=salcal2&id=GALE|A98271968&v=2.1&it=r&sid=ITOF&asid=eab7979a> [Accessed 18 February 2018].

ChitarreMagazine (Producer). (2012) *Frank Gambale e Gambale tuning - di simone sello*. [Video Online] Available at: <http://www.youtube.com/watch?v=NyC4ysU3_FU> [Accessed 18 October 2014].

Cohen, A. (2005). Stefan Grossman: country blues guitar in open tunings. [Online] *Sing Out!,* 49:1, p. 152. Available at: <http://go.galegroup.com.salford.idm.oclc.org/ps/i.do?&id=GALE|A129812335&v=2.1&u=salcal2&it=r&p=LitRC&sw=w> [Accessed 28 October 2017].

Damon, J.H.K. (Producer). (2017). *Oliver Messiaen – Prelude for piano (1964) [with score].* [Video Online] Available at: <https://www.youtube.com/watch?v=5yQ00rL6_j0> [Accessed 16 September 2018].

Ellis, A. (2000). DADGAD for dummies. [Online] *Guitar Player*, 34:9, pp. 60–66. Available at: <http://go.galegroup.com.salford.idm.oclc.org/ps/i.do?&id=GALE|A63842569&v=2.1&u=salcal2&it=r&p=ITOF&sw=w> [Accessed 28 October 2017].

Ellis, A. & Simpson, M. (1995). Hexagrams of the heavens: exploring Joni's alternate tunings. [Online] *Guitar Player,* 29:2, p. 56. Available at: <http://go.galegroup.com.salford.idm.oclc.org/ps/i.do?&id=GALE|A16327143&v=2.1&u=salcal2&it=r&p=ITOF&sw=w&authCount=1> [Accessed 28 October].

Ellis, A. (2000). Learn to play hawaiian slack-key guitar. [Online] *Guitar Player,* 34:7, p. 131. Available at: <http://go.galegroup.com.salford.idm.oclc.org/ps/i.do?&id=GALE|A62353630&v=2.1&u=salcal2&it=r&p=ITOF&sw=w> [Accessed 28 October].

Ellis, A. (2004). Discover DADGAD: Laurence Juber reveals the secrets of this enchanted open tuning. [Online] *Guitar Player,* 38:10, p. 90. Available at: <http://go.galegroup.com.salford.idm.oclc.org/ps/i.do?&id=GALE|A121571421&v=2.1&u=salcal2&it=r&p=ITOF&sw=w> [Accessed 28 October].

Erlewine, Dan, 2000. Repairs setting intonation. [Online] *Guitar Player,* 34:12, p. 109. Available at: <http://go.galegroup.com.salford.idm.oclc.org/ps/i.do?&id=GALE|A66498133&v=2.1&u=salcal2&it=r&p=ITOF&sw=w&authCount=1> [Accessed 30 October].

Evangelista, G. (2011). *Physical model of the string-fret interaction.* [Online] Proc. Of Digital Audio Effect Conf, pp. 345–351. Available at: <http://liu.diva-portal.org/smash/get/diva2:535799/FULLTEXT01.pdf> [Accessed 28 October].

Faherty, M. & Aaronson, N.L. (2010). Acoustical differences between treble guitar strings of different tension (i.e. gauge). [Online] *The Journal of the Acoustical Society of America,* 128:4, p. 2449. Available at: <https://doi-org.salford.idm.oclc.org/10.1121/1.3508761> [Accessed 29 October 2017].

Fink, M. (2007). *Stringing and tuning the Renaissance four-course guitar: interpreting the primary Sources.* Available at: <http://www.laguitarra-blog.com/wp-content/uploads/2012/03/strining-and-tuning-the-renaissance-four-course-guitar.pdf> [Accessed 11 September 2018].

Fiore, G. (2013). *The just intonation guitar works of Lou Harrison, James Tenney, and Larry Polansky.* (PhD Thesis), University of California, Santa Cruz. Available at: <https://escholarship.org/uc/item/7nc23344> [Accessed 30 October 2017].

Flowers, C. J. (2015). *Altered states of performance: scordatura in the classical guitar repertoire.* (DMA thesis), University of Georgia, Athens. Available at: <https://getd.libs.uga.edu/pdfs/flowers_corey_j_201512_dma.pdf> [Accessed 14 September 2018].

Fox, D. (1999). *The Earvana nut.* [Online] Guitar Player, 33:10, p. 111. Available at: <http://go.galegroup.com.salford.idm.oclc.org/ps/i.do?&id=GALE|A55710465&v=2.1&u=salcal2&it=r&p=ITOF&sw=w> [Accessed 30 October 2017].

Frank, M. (2015). *Robert Fripp discusses new standard tuning.* [Video Online] Available at: <http://geargods.net/tutorials/robert-fripp-new-standard-tuning-guitar/> [Accessed 11 September 2018].

Gerken, T. (2015). The Journeyman: Laurence Juber on arranging in DADGAD, being a first-call session player, and his latest album, 'Fingerboard Road'. [Online] *Guitar Player,* 49:6, p46. Available at: <http://go.galegroup.com.salford.idm.oclc.org/ps/i.do?&id=GALE|A413708695&v=2.1&u=salcal2&it=r&p=ITOF&sw=w> [Accessed 28 October 2017].

Gold, J. (2008). A perspective on DADGAD. [Online] *Guitar Player,* 42:9, p. 125. Available at: <http://go.galegroup.com.salford.idm.oclc.org/ps/i.do?&id=GALE|A192687927&v=2.1&u=salcal2&it=r&p=ITOF&sw=w&authCount=1> [Accessed 28 October 2017].

Gold, Jude, (2008). Beginner: Jimmy Page's mesmerizing open tunings. [Online] *Guitar Player,* 42:1, p. 142. Available at: <http://go.galegroup.com.salford.idm.oclc.org/ps/i.do?&id=GALE|A171772585&v=2.1&u=salcal2&it=r&p=ITOF&sw=w> [Accessed 28 October].

Gomm, J. (Producer). (2011). *Jon Gomm – Passionflower.* [Video Online] Available at: <https://www.youtube.com/watch?v=nY7GnAq6Znw> [Accessed 6 January 2016].

Gore, J. (1999). Near-perfect pitch. [Online] *Guitar Player,* 33:351, p. 103. Available at: **<**http://go.galegroup.com.salford.idm.oclc.org/ps/i.do?&id=GALE|A57643571&v=2.1&u=salcal2&it=r&p=ITOF&sw=w> [Accessed 30 October].

Guy, P. (2007). *A brief history of the guitar.* [Online] Available at: <https://www.guyguitars.com/eng/handbook/BriefHistory.html> [Accessed 11 September 2018] .

Hemlok88 (Producer). (2008) *Skip James – hard time killin' floor blues.* [Video Online] Available at: <https://www.youtube.com/watch?v=Rv-_mzVBSF8> [Accessed 11 September 2018].

Houtsma, A.J.M. (1982). Inharmonicity of wound guitar strings. [Online*] The Journal of the Acoustical Society of America,* 71:S1, p. S9. Available at: <http://asa.scitation.org.salford.idm.oclc.org/doi/abs/10.1121/1.2019676> [Accessed 29 October 2017].

Humphries, J. (2014). *Electric etudes: Andy Summers.* [Online] Available at: <https://www.premierguitar.com/articles/21703-electric-etudes-andy-summers> [Accessed 16 September 2018].

Hungaroton - Classical (Producer). (2014). *Bartók: out of doors: IV. the night's music* [Video Online] Available at: <https://www.youtube.com/watch?v=cZT6-ifNqiY> [Accessed 16 September 2018].

James Taylor. (Producer). (2012). *Bonus lesson: tuning – official James Taylor guitar lessons.* [Video Online] Available at: <https://www.youtube.com/watch?v=V2xnXArjPts> [Accessed 16 September 2018].

Jordon, N. (Producer). (2013) *Cross road blues – Robert Johnson (1936).* [Video Online] Available at: <https://www.youtube.com/watch?v=GtDlZdhHRCI> [Accessed 11 September 2018].

Kemp, J.A. (2017). The physics of unwound and wound strings on the electric guitar applied to the pitch intervals produced by tremolo/vibrato arm systems. [Online] *PLoS ONE,* 12:9, e0184803. Available at: <https://doi.org/10.1371/journal.pone.0184803> [Accessed 29 October 2017].

Linares, O. (Producer). (2013) *My black mama (Part II) – Son House.* [Video Online] Available at: <https://www.youtube.com/watch?v=xUWSSMRrz1s> [Accessed 11 September 2018].

Medbøe, H. (2013). *Cultural identity and transnational heritage in contemporary jazz: a practice-based study of composition and collaboration*. (PhD thesis), Edinburgh Napier University. Available at: <https://www.napier.ac.uk/~/media/worktribe/output-182664/phdfinalrevpdf.pdf> [Accessed 17 September 2018].

Mostrom, T. (1997). Derek Bailey: More playing per cubic second. [Online] *Guitar Player,* 31:1, p. 41. Available at: <http://go.galegroup.com.salford.idm.oclc.org/ps/i.do?&id=GALE|A18945854&v=2.1&u=salcal2&it=r&p=ITOF&sw=w&authCount=1> [Accessed 30 October].

Nicolas, J. (2017). *What is the point in different guitar tuning?* [Online] Available at: <https://music.stackexchange.com/questions/57509/what-is-the-point-in-different-guitar-tuning> [Accessed 13 September 2018].

O'Donnell, E. (2015). *5 skills you won't learn in school, skill three: the secret to great time.* [Online] Available at: <https://www.jazzadvice.com/the-secret-to-great-time/> [Accessed 16 September 2018].

Olla-vogala (Producer). (2015). *Arnold Schoenberg – piano concerto , op. 42.* [Video Online] Available at: <https://www.youtube.com/watch?v=JEY9lmCZbIc> [Accessed 16 September 2018].

OpenGoldberg (Producer). (2015). *Well-tempered clavier (J.S. Bach), book 1, Kimiko Ishizaka, piano.* [Video Online] Available at: <https://www.youtube.com/watch?v=nPHIZw7HZq4> [Accessed 16 September].

Owens, J. (Date Unknown). *Standard tuning: how EADGBE came to be.* [Online] Available at: <https://www.fender.com/articles/tech-talk/standard-tuning-how-eadgbe-came-to-be> [Accessed 11 September 2018].

Patt, R. (n.d.). *3rd tuning.* [Online] Available at: <http://www.ralphpatt.com/Tune.html> [Accessed 17 July 2017].

Permanent Sounds (Producer). (2011) *Davy Graham – She moves through the fair (1962).* [Video Online] Available at: <https://www.youtube.com/watch?v=hvpTVn_Ltzc> [Accessed 11 September 2018].

Phillips, J. (1996). Six strings that sing Hawaii. [Online] *Sunset,* 196:7, p. 26. Available at: <http://go.galegroup.com.salford.idm.oclc.org/ps/i.do?&id=GALE|A18693465&v=2.1&u=salcal2&it=r&p=ITOF&sw=w> [Accessed 28 October 2017].

Ransom, K. (1994). Modern Hawaiian slack-key masters. [Online] *Guitar Player,* 28:12, p. 97. Available at: <http://go.galegroup.com.salford.idm.oclc.org/ps/i.do?&id=GALE|A15885902&v=2.1&u=salcal2&it=r&p=ITOF&sw=w> [Accessed 28 October].

Ratner, B. (1998). Performance notes: alternate tunings onstage. [Online] *Guitar Player,* 32:7, p. 22. Available at: <http://go.galegroup.com.salford.idm.oclc.org/ps/i.do?&id=GALE|A20759003&v=2.1&u=salcal2&it=r&p=ITOF&sw=w> [Accessed 28 October 2017].

Sethares, W. (2011). *Alternate tuning guide.* [Online] Available at: <http://sethares.engr.wisc.edu/alternatetunings/alltunings.pdf> [Accessed 17 July 2017].

Shamisen in Tokyo (Producer). (2017). *Shamisen girls Ki & Ki – tsugaru jongara bushi.* [Video Online] Available at: <https://www.youtube.com/watch?v=RcqO0zkyQRo> [Accessed 16 September 2018].

Simpson, M. (1995). Expanding open tunings. [Online] *Guitar Player,* 29:6, p. 144. Available at: <http://go.galegroup.com.salford.idm.oclc.org/ps/i.do?&id=GALE|A16822577&v=2.1&u=salcal2&it=r&p=ITOF&sw=w&authCount=1> [Accessed 28 October].

Taylor, C. (2012). *Horn-like phrasing for guitar.* [Online] Available at: <https://www.guitarplayer.com/miscellaneous/horn-like-phrasing-for-guitar> [Accessed 08 September 2018].

Thatconvergenceguy (Producer). (2010). *Michael Manring "the enormous room" live.* [Video Online] Available at: <https://www.youtube.com/watch?v=Gu2XbSR2Nvw> [Accessed 5 January 2016].

Theabsentwalrus (Producer). (2016). *Alternate tunings* [Online] Available at: <http://equipboard.com/forums/guitarists-bassists/topics/alternate-tunings> [Accessed 13 September 2018].

Troutman, J.W. (2013). Steelin' the slide: Hawaii and the birth of the blues guitar. [Online] *Southern Cultures*. 19 (1), pp. 26-52. Available at: <http://go.galegroup.com.salford.idm.oclc.org/ps/i.do?&id=GALE|A318901392&v=2.1&u=salcal2&it=r&p=LitRC&sw=w> [Accessed 11 September 2018].

Warnock, M. (2013). *How to swing guitar scales like a horn player.* [Online] Available at: <https://www.guitarworld.com/lessons/jazz-guitar-corner-how-swing-guitar-scales-horn-player> [Accessed 08 September 2018].

Zócalo Public Square (Producer). (2017). *Interview with Eddie Van Halen: is rock 'n' roll all about reinvention?* [Online] Available at: <https://www.youtube.com/watch?v=yb26D8bBZB8> [Accessed 14 September 2018].

Muscle Memory as a Compositional Device

Frisell, B. (2000). An approach to guitar fingering. In J. Zorn (Ed.), *Arcana: musicians on music* (pp. 140-144). New York, Granary Books Inc.

Krantz, W. (2004). *An improviser's OS.* New York, Wayne Krantz.

Lehmann, A.C. et al. (2007). *Psychology for musicians: understanding and acquiring the skills.* Oxford, New York. Oxford University Press.

Sudnow, D. (1978). *Ways of the hand.* London, Routledge & Kegan Paul Ltd.

Sloboda, J. (2005). *Exploring the musical mind: cognition, emotion, ability, function.* Oxford; New York. Oxford University Press.

Tedesco, T. 2008. *For guitar players only.* Van Nuys, Alfred Publishing.

Online Resources

Cochrane, R. (n.d.). *What is "muscle memory"?* [Online] Available at: <http://cochranemusic.com/guitar-muscle-memory-speed> [Accessed 26 October 2017].

Darling, C. (2009). Muscle memory, ear training, and intonation. [Online] *Teaching Music,* 17:1, p. 49. Available at: <http://go.galegroup.com.salford.idm.oclc.org/ps/i.do?&id=GALE|A206054883&v=2.1&u=salcal2&it=r&p=AONE&sw=w&authCount=1> [Accessed 26 October 2017].

Dean, J. (2014). Pat Metheny's finger routes: the role of muscle memory in guitar improvisation. *Jazz Perspectives,* 8:1, pp. 1-27. Available at: <http://dx.doi.org.salford.idm.oclc.org/10.1080/17494060.2014.960070> [Accessed 26 October 2017].

Dobbs, I. (2018). *Neuroplasticity.* [Online] Available at: <https://www.scienceforsport.com/neuroplasticity/> [Accessed 18 September 2018].

Duke, Robert A., Davis Cash, C., & Allen, S.E. (2011). Focus of attention affects performance of other skills in music. [Online] *Journal of Research in Music Education,* 59:1, pp. 44-55. Available at: <https://www-jstor-org.salford.idm.oclc.org/stable/23019436> [Accessed 17 September 2018].

GlassJaww (Producer). (2014). *Practicing scales for alternate tunings* [Online] Available at: <https://www.ultimate-guitar.com/forum/showthread.php?t=1654002> [Accessed 13 September 2018].

Jenkins, B. (2016). *Muscle memory is a requirement for all musicians* [Online] Available at: <https://yourmusiclessons.com/blog/muscle-memory-requirement-musicians/> [Accessed 14 September 2018].

Lam, G. (2012). *Muscle memory: only for "smart musicians"?* [Online] Available at: <http://artiden.com/muscle-memory-musicians-secret-weapon/> [Accessed 26 October 2017].

Levi (Producer). (2015). *Learning to play music: the phenomena of muscle memory.* [Online] Available at: <https://www.joytunes.com/blog/learn-to-play/learning-music-the-phenonmenon-of-muscle-memory/> [Accessed 14 September 2018].

McIntosh, C. (Ed.). (n.d.). *Cambridge dictionary.* [Online] Available at: <https://dictionary.cambridge.org/dictionary/english/muscle-memory> [Accessed 21 September 2018].

Moorman, C. & Miner, A. (1998). Organizational Improvisation and Organizational Memory [Online] *The Academy of Management Review,* 23:4, pp. 698-723. Available at: <http://www.jstor.org.salford.idm.oclc.org/stable/259058> [Accessed 21 September 2018].

Motto, D. (2010). *Learn faster by playing slower: muscle memory techniques that work.* [Online] Available at: <http://www.moltomusic.com/music-practice-tips/slower-is-faster/#comments> [Accessed 26 October].

Scarr, J. & Green, R. (2010). Retrieval of guitarist fingering information using computer vision. [Online] In *2010 25th International Conference of Image and Vision Computing New Zealand (IVCNZ),* pp. 1–7. Available at: <http://ieeexplore.ieee.org.salford.idm.oclc.org/document/6148852/> [Accessed 29 October 2017].

Simmons, A.L. (2012) Distributed Practice and Procedural Memory Consolidation in Musicians' Skill Learning. [Online] *Journal of Research in Music Education,* 59:4, pp. 357-368. Available at: <https://www-jstor-org.salford.idm.oclc.org/stable/41348843> [Accessed 17 September 2018].

Robb, T. (2016). *How to play like a pro: the neuroscience of muscle memory.* [Online] Available at: <http://neurologicalsociety.org/play-like-pro-neuroscience-muscle-memory/> [Accessed 18 September 2018].

Waters, S. (2015). Tullis Rennie's muscle memory: listening to the act of listening. [Online] *Contemporary Music Review,* 34:1, pp. 1–11. Available at: <http://dx.doi.org.salford.idm.oclc.org/10.1080/07494467.2015.1077563> [Accessed 26 October 2017].

Notation Methods for Guitar

Andriessen, L., and Schonberger, E. (1983). *The apollonian clockwork on Stravinsky.* New York, Oxford University Press.

Belkadi, J.M. (2007). *A modern approach to jazz, rock & fusion Guitar.* Milwaukee, Hal Leonard Corporation.

Collier, G. (2009). *The jazz composer – moving music off the paper.* London, Northway Publications.

Ferneyhough, B. (1998). 2nd Ed. *Collected writings.* Abingdon, Routledge.

Griffiths, P. (2010). 3rd Ed. *Modern music and after.* New York, Oxford University Press.

Kessel, B. (1992). *The jazz guitar artistry of Barney Kessel (Volume 1).* San Diego, Windsor Music Co.

Kessel, B. (1997). *The jazz guitar artistry of Barney Kessel (Volume 2).* San Diego, Windsor Music Co.

Leavitt, W. (1966). *A modern method for guitar volume 1.*Boston, Berklee Press.

Leavitt, W. (1968). *A modern method for guitar volume 2*. Boston, Berklee Press.

Leavitt, W. (1971). *A modern method for guitar volume 3.* Boston, Berklee Press.

Ledbetter, D. (2002). *Bach's well-tempered clavier: The 48 preludes and fugues.* New Haven, London. Yale University Press.

Maconie, R. (1976). *The works of Stockhausen*. London and Salem, Marion Boyars Ltd.

Ochs, L. (2000). Devices and strategies for structured improvisation. In J. Zorn (Ed.), *Arcana: musicians on music* (pp. 325-335). New York, Granary Books Inc.

Ostertag, B. (2000). All the rage. In J. Zorn (Ed.), *Arcana: musicians on music* (pp. 193-202). New York, Granary Books Inc.

Radano, R. (1993). New *musical figurations: Anthony Braxton's cultural critique.* Chicago and London, The University of Chicago Press.

Russell, G. (1953). *The lydian chromatic concept of tonal organization.* New York, Concept Publishing.

Schuller, G. (1986). *Early jazz: its roots and musical development*, New York; Oxford: Oxford University Press.

Sebesky, D. (1994). 3rd Ed. *The contemporary arranger definitive edition.* Van Nuys, Alfred Publishing.

Sher, C. (2004). 6th Ed. *The real book.* Wisconsin, Hal Leonard Corporation.

Tagg, P. (2013). *Music's meanings: a modern musicology for non-musos.* New York, Mass Media Music Scholar's Press.

Wishart, T. (1996). *On Sonic Art.* Amsterdam, Harwood Academic.

Zorn, J. (2000). *Arcana: musicians on music.* New York, Granary Books Inc.

Online Resources

Alcabasa, L. & Marcos, N., (2012). Automatic guitar music transcription. [Online] In *2012 International Conference on Advanced Computer Science Applications and Technologies (ACSAT),* pp. 197–202. Available at: <http://ieeexplore.ieee.org.salford.idm.oclc.org/xpls/icp.jsp?arnumber=6516351> [Accessed 29 October 2017].

Alden, J. (2007). From neume to folio: mediaeval influences on Earle Brown's graphic notation. [Online] *Contemporary Music Review,* 26:3-4, pp. 315–332. Available at: <http://dx.doi.org.salford.idm.oclc.org/10.1080/07494460701414140> [Accessed 26 October 2017].

Anon. (n.d.). *George Russell's lydian chromatic concept of tonal organization*. [Online] Available at: <https://www.lydianchromaticconcept.com/main.html> [Accessed 17 September 2018].

Anon (n.d.). *Partitur von klavierstück XI (originalgröße 54 × 94 cm).* [Online] Available at: <https://upload.wikimedia.org/wikipedia/de/e/e6/Stockhausen-klavierst%C3%BCck-XI-Score-Scaled.jpg> [Accessed 18 September 2018].

Asia, D. (2007). Reflections on Earle Brown and his music. [Online] *Contemporary Music Review,* 26:3-4, pp. 311–313. Available at: <http://dx.doi.org.salford.idm.oclc.org/10.1080/07494460701414132> [Accessed 26 October].

Barbancho, A. M. et al. (2012). Automatic transcription of guitar chords and fingering from audio. [Online] *IEEE Transactions on Audio, Speech, and Language Processing,* 20:3, pp. 915–921. Available at: <https://ieeexplore-ieee-org.salford.idm.oclc.org/document/6064873/?reload=true> [Accessed 29 October 2017].

BC (Producer). (2018). *Brian Ferneyhough – kurze schatten II for guitar (score video).* [Video Online] Available at: <https://www.youtube.com/watch?v=jQu3TWRORm4> [Accessed 16 September 2018].

Beal, A.C. (2007). An interview with Earle Brown. [Online] *Contemporary Music Review,* 26:3-4, pp. 341–356. <http://dx.doi.org.salford.idm.oclc.org/10.1080/07494460701414223> [Accessed 26 October 2017].

Beaucage, R. (2005). *Contact with Stockhausen.* [Online] Available at: <http://www.scena.org/lsm/sm11-3/Stockhausen_en.htm> [Accessed 17 September 2018].

Bergstrøm-Nielsen, C. (2010). Graphic notation – The simple sketch and beyond. [Online] *Nordic Journal of Music Therapy,* 19:2, pp. 162–177. Available at: <http://dx.doi.org.salford.idm.oclc.org/10.1080/08098131.2010.497227> [Accessed 1 November 2017].

Bergstrøm-Nielsen, C. (2009). Graphic notation in music therapy: A discussion of what to notate in graphic notation and how. [Online] *Approaches: Music Therapy & Special Music Education,* 1:2, pp. 72–92. Available at: <http://approaches.gr/wp-content/uploads/2015/09/Approaches_122009_Bergstrom_Article.pdf> [Accessed 1 November 2017].

Blum, E. (2007). Remarks re: four systems. [Online] *Contemporary Music Review,* 26: 3-4, pp. 367–369. Available at: <http://dx.doi.org.salford.idm.oclc.org/10.1080/07494460701414306> [Accessed 27 October 2017].

Borgo, D. (2007). Free jazz in the classroom: an ecological perspective to music education. [Online] *Jazz Perspectives,* 1:1, pp. 61-88. Available at: <http://www.tandfonline.com/doi/abs/10.1080/17494060601061030> [Accessed 28 January 2014].

Boulez, P. (2007). … ' ouvert ', encore … [Online] *Contemporary Music Review,* 26:3-4, pp. 339–340. <http://dx.doi.org.salford.idm.oclc.org/10.1080/07494460701414181> [Accessed 27 October 2017].

Boutwell, B. (2014). 'The breathing of sound itself': notation and temporality in Feldman's music to 1970. [Online] *Contemporary Music Review,* pp. 1–40. <http://dx.doi.org.salford.idm.oclc.org/10.1080/07494467.2014.882548> [Accessed 27 October 2017].

Joshi, T. (Ed.). (n.d.). *Earle Brown* [Online] Available at: <https://alchetron.com/Earle-Brown-757559-W> [Accessed 17 July 2017].

Brown, E. (2008). On December 1952. [Online] *American Music,* 26:1, pp. 1-12. Available at: <http://www.jstor.org/stable/pdf/40071686.pdf?refreqid=excelsior%3Afecf44459fd2e8767914713323c7abc8> [Accessed 27 October 2017].

Brown, E. (1986). The notation and performance of new music. [Online] *Musical Quarterly*, 72, p. 180. Available at: <http://www.jstor.org.salford.idm.oclc.org/stable/pdf/948118.pdf?refreqid=excelsior%3Afb8e2fe08534c9211837e9607c4ea1e5> [Accessed 27 October 2017].

Brown, E. (n.d.). *Available forms II.* [Online] Available at: <http://www.earle-brown.org/works/view/27> [Accessed 18 September 2018].

Castro-Magas, D. (2016). Gesture, mimesis and image: Adorno, Benjamin and the guitar music of Brian Ferneyhough. *Tempo,* 70:278, pp. 16–28. Available at: https://search-proquest-com.salford.idm.oclc.org/docview/1823860511/fulltextPDF/FF71CEBBBF054CCBPQ/1?accountid=8058 [Accessed 30 October 2017].

Cohen, S. et al. (2012). A multiple-perspective approach to graphic notation. [Online] *Nordic Journal of Music Therapy,* 21:2, pp. 153–175. Available at: <http://dx.doi.org.salford.idm.oclc.org/10.1080/08098131.2011.629733> [Accessed 26 October 2017].

Dalby, A. (2015). *R. Murray Schafer: "entrance to the harbour" (The Vancouver Soundscape 1973).* [Online] Available at: https://soundcloud.com/nnealby/r-murray-schafer-entrance-to-the-harbour-the-vancouver-soundscape-1973 [Accessed 26 July 2017].

Dart, T. (2001). *Eye music.* [Online] Grove Music Online. Available at: https://doi.org/10.1093/gmo/9781561592630.article.09152 [Accessed 18 February 2018].

Derekxkwan (Producer). (2013). *Earl Browne's December 1952.* [Video Online] Available at: <https://www.youtube.com/watch?v=ymjKWxp7s_s> [Accessed 13 July 2017].

Doublemain, (2008). *John Zorn documentary part 1*. [Video Online] Available at: <https://www.youtube.com/watch?v=c7jyzXY1JAo> [Accessed 5 September 2014].

Exexalien (Producer). (2013) *John Oswald – dab [full song].* [Video Online] Available at: <https://www.youtube.com/watch?v=8xIWLG-F0Ag> [Accessed 9 January 2016].

Feldman, M. (1963). *De Kooning.* [Online] Available at: <https://www.pinterest.com/pin/347762402445854602/> [Accessed 17 July 2017].

Fiss, X. & Kwasinski, A. (2011). Automatic real-time electric guitar audio transcription. In *2011 IEEE international conference on*, *acoustics, speech and signal processing (ICASSP),* pp. 373–376. Available at: <http://ieeexplore.ieee.org.salford.idm.oclc.org/xpls/icp.jsp?arnumber=6516351> [Accessed 29 October 2017].

Førisdal, A. (2017). *Music of the margins. radically idiomatic instrumental practice in solo guitar works by Richard Barrett, Brian Ferneyhough and Klaus K. Hübler.* [Online] Available at: <https://brage.bibsys.no/xmlui/handle/11250/2431027> [Accessed 30 October 2017].

Fox, C. (2014). Opening offer or contractual obligation? On the prescriptive function of notation in music today. [Online] *Tempo,* 68:269, pp. 6–19. Available at: <https://search-proquest-com.salford.idm.oclc.org/docview/1535617602/fulltextPDF/E0B707D084D140DCPQ/1?accountid=8058> [Accessed 1 November 2017].

Freeman, J. (2012). *Real-time music notation, collaborative improvisation, and laptop ensembles.* [Online] Available at: <http://distributedmusic.gatech.edu/jason/publications/pdf_files_of_publications/sglc_nime_2012.pdf> [Accessed 6 January 2016].

Gaare, M. (1997). Alternatives to traditional notation. [Online] *Music Educators Journal,* 83:5, pp. 17-23. DOI: <https://doi.org/10.2307%2F3399003> [Accessed 16 September].

Gerubach (Producer). (2011). *Penderecki – threnody (animated score).* [Video Online] Available at: <https://www.youtube.com/watch?v=HilGthRhwP8> [Accessed 17 September 2018].

Giorgia Lupi (Producer). (n.d.). *Nonstop.* [Online] Available at: <https://www.pinterest.co.uk/pin/177047829079260701/> [Accessed 16 September 2018].

Grella-Możejko, P. (2007). Earle Brown—form, notation, text. [Online] *Contemporary Music Review,* 26:3-4, pp. 437–469. <http://dx.doi.org.salford.idm.oclc.org/10.1080/07494460701424636> [Accessed 26 October 2017].

Griffiths, P. (2001). *Aleatory.* [Online] Grove Music Online. Available at: <http://www.oxfordmusiconline.com.salford.idm.oclc.org/subscriber/article/grove/music/00509> [Accessed 31 October 2017].

Jeongwon J. & Hoo Song, S. (2002). Roland Barthes' "text" and aleatoric music: is "the birth of the reader" the birth of the listener? [Online] *Muzikologija,* 2002:2, pp. 263–281. Available at: <http://www.doiserbia.nb.rs/img/doi/1450-9814/2002/1450-98140202263J.pdf> [Accessed 30 October 2017].

Johnson, S. & Mattis, O. (2001). *New York school.* Grove Music Online. [Online] Available at: <http://www.oxfordmusiconline.com.salford.idm.oclc.org/subscriber/article/grove/music/47036> [Accessed 1 November 2017].

Johnson, S. (2001). *Feldman, Morton.* Grove Music Online. [Online] Available at: <http://www.oxfordmusiconline.com.salford.idm.oclc.org/subscriber/article/grove/music/09435> [Accessed 1 November 2017].

Kanno, M. 2007. Prescriptive notation: limits and challenges. [Online] *Contemporary Music Review,* 26: 2, pp. 231-254. DOI: <https://doi-org.salford.idm.oclc.org/10.1080/07494460701250890>

Kim, R.Y. (2012). John Cage in separate togetherness with jazz. [Online] *Contemporary Music Review,* 31:1, pp. 63–89. DOI: <http://dx.doi.org.salford.idm.oclc.org/10.1080/07494467.2012.712284>

Kyriakos Kontozoglou, (2010). *John Zorn – spillane – part 1*. [Video Online] Available at: <https://www.youtube.com/watch?v=65lHVU8hc1o> [Accessed 5 September 2015].

Lewis, G. E. (1996). Improvised music after 1950: afrological and eurological perspectives. [Online] *Black Music Research Journal,* 22, pp. 215-246. Available at: <http://www.jstor.org.salford.idm.oclc.org/stable/1519950> [Accessed 6 January 2016].

Macrae, R. & Dixon, S. (2010). A guitar tablature score follower. [Online] In *2010 IEEE International Conference on Multimedia and Expo (ICME),* pp. 725–726. Available at: <http://ieeexplore.ieee.org.salford.idm.oclc.org/document/5582963/citations?part=1> [Accessed 18 February 2018].

Marian-Bălaşa, M. (2005). Who Actually Needs Transcription? Notes on the Modern Rise of a Method and the Postmodern Fall of an Ideology. [Online] *The World of Music,* 47:2, pp. 5-29. Available at: <https://www.jstor.org/stable/41699643> [Accessed 16 September 2018].

McKerrell, S. (n.d.). *Transcription and analysis guide notes.* [Online] Available at: <https://research.ncl.ac.uk/media/sites/researchwebsites/icmus/Transcription%20and%20Analysis%20basic%20notes%20McKerrell.pdf> [Accessed 16 September 2018].

Miller, A. (Producer). (1990). *John Cage - I have nothing to say and I am saying it.* [Video Online] Available at: <https://salford.kanopystreaming.com/video/john-cage-i-have-nothing-say-and-i-am-saying> [Accessed 1 November 2017].

Mumma, G. (2007). Earle's worlds. [Online] *Contemporary Music Review,* 26:3-4, pp. 427–428. Available at: <http://dx.doi.org.salford.idm.oclc.org/10.1080/07494460701414413> [Accessed 26 October 2017].

Musical Architect (Producer). (n.d.). *Mauricio Kagel: prima vista.* [Online] Available at: <https://www.pinterest.com/pin/308778118178498255/> [Accessed 17 September 2018].

Myers, L. (2012). Possible solutions to the guitar tablature problem: why an international approach may be best for all. [Online] *Cardozo Arts & Entertainment Law Journal,* 30:2, pp. 403–433. Available at: <http://heinonline.org.salford.idm.oclc.org/HOL/Page?public=false&handle=hein.journals/caelj30&page=403&collection=journals> [Accessed 30 October 2017].

Nance, R. (2010). *Plastic music, aural models and graphical representation.* [Online] econtact! 12:3. Available at: <http://econtact.ca/12_3/nance_plasticmodels.html> [Accessed 11 November 2014].

Nicholls, D. (2002). *The Cambridge companion to John Cage* [Online] Cambridge, Cambridge University Press. Available at: <https://doi-org.salford.idm.oclc.org/10.1017/CCOL9780521783484> [Accessed 1 November 2017].

Ozment, Kurt, (2011). Musical, rhetorical, and visual material in the work of Feldman. [Online] *CLCWeb: Comparative Literature and Culture,* 13:3, p. 17. Available at: <http://go.galegroup.com.salford.idm.oclc.org/ps/i.do?&id=GALE|A268403894&v=2.1&u=salcal2&it=r&p=LitRC&sw=w&authCount=1> [Accessed 26 October 2017].

Pine, L. (2011). Conversation with Earle Brown about constructivism and Schillinger's system of musical composition. [Online] *Contemporary Music Review,* 30:2, pp. 167–178. Available at: <http://dx.doi.org.salford.idm.oclc.org/10.1080/07494467.2011.636203> [Accessed 26 October 2017].

Pritchett, J. et al. (2012). *Cage, John.* [Online] Grove Music Online. Available at: <http://www.oxfordmusiconline.com.salford.idm.oclc.org/subscriber/article/grove/music/A2223954> [Accessed 1 November 2017].

Radano, R. M. (1986). Braxton's reputation. [Online] *Musical Quarterly,* 72:4, pp. 503–522. Available at: <https://doi-org.salford.idm.oclc.org/10.1093/mq/LXXII.4.503> [Accessed 30 October 2017].

Riley, H. (1966). Aleatoric procedures in contemporary piano music. [Online] *The Musical Times,* 107:1478, pp. 311–312. Available at: <http://www.jstor.org.salford.idm.oclc.org/stable/pdf/951823.pdf?refreqid=excelsior%3Af3fe2bbe172086fdddee07ca4ae48743> [Accessed 30 October 2017].

Seeger, C. (1958). Prescriptive and descriptive music writing [Online] *The Musical Quarterly,* 44:2, pp. 184-195. Available at: <https://www-jstor-org.salford.idm.oclc.org/stable/740450> [Accessed 16 September 2018].

Seeger, C. (1964). Report of the chairman-moderator [Online] *Ethnomusicology,* 8:3, pp. 272-277. DOI: <https://doi.org/10.2307/850129> [Accessed 17 September 2018].

Solomon, L.J. (2002). Sym*metry as a compositional determinant* [Online]. Available at: <http://solomonsmusic.net/diss.htm> [Accessed 17 July 2017].

Tagg, P. (1999). *Introductory notes to the semiotics of music.* [Online] Available at: <http://www.tagg.org/xpdfs/semiotug.pdf > [Accessed 5 January 2016].

TheWelleszCompany (Producer). (2011). *John Cage: williams mix (1952/1953).* [Video Online] Available at: <https://www.youtube.com/watch?v=9ql4Ophbt7k> [Accessed 9 January 2016].

Volans, K. (2014). What is Feldman? [Online] *Tempo,* 68:270, pp. 7–14. Available at: <https://search-proquest-com.salford.idm.oclc.org/docview/1559541033/fulltextPDF/D8C43D8F57B0463DPQ/1?accountid=8058> [Accessed 1 November 2017].

Walser, R. (1993). Out of notes: signification, interpretation, and the problem of Miles Davis. [Online] *The Musical Quarterly,* 77, pp. 343-365. Available at: <http://www.jstor.org/stable/742559> [Accessed 28 January 2014].

Welsh, J.P. (1994). Open form and Earle Brown's modules I and II (1967). [Online] *Perspectives of New Music,* 32:1, pp. 254–290. Available at: <http://www.jstor.org.salford.idm.oclc.org/stable/pdf/833173.pdf?refreqid=excelsior:70e9daaae3c4e7deca6f9243bda110ec> [Accessed 27 October 2017].

Wishart, T. (1996). *On sonic art.* [Online] Amsterdam, Harwood Academic Publishers. Available at: <https://monoskop.org/images/2/21/Wishart_Trevor_On_Sonic_Art.pdf> [Accessed 31 October 2017].

Yazawa, K., et al. (2014). Automatic transcription of guitar tablature from audio signals in accordance with player's proficiency. In *2014 IEEE International Conference on Acoustics, Speech and Signal Processing (ICASSP).* May 2014, pp. 3122-3126. DOI: <https://doi.org/10.1109/ICASSP.2014.6854175> [Accessed 16 September].

Yazawa, K., et al. (2013). Audio-based guitar tablature transcription using multipitch analysis and playability constraints. In *2014 IEEE International Conference on Acoustics, Speech and Signal Processing (ICASSP).* May 2013, pp. 196-200. DOI: <https://doi.org/10.1109/ICASSP.2013.6637636> [Accessed 16 September 2018].

Discography

Atkins, C. (1973). *Alone* [AUDIO CD]. RCA Victor.

Atkins, C. (1953). *Jazz from the Hills* [AUDIO CD]. RCA Victor.

Bailey, D. (1971). *Solo Guitar* [AUDIO CD]. Incus 2.

Bailey, D. & Holland, D. (1971). *Improvisations for Cello and Guitar* [AUDIO CD]. ECM.

Bailey, D. (1975). *Improvisation* [AUDIO CD]. Get Back.

Bailey, D. (1997). Music and Dance [AUDIO CD]. Table of the Elements.

Bailey, D. (2002). Ballads. [AUDIO CD]. Tzadik.

Beck, J. (1976). *Wired* [AUDIO CD]. Epic.

Benson, G. (1967). *The George Benson Cookbook* [AUDIO CD]. Columbia.

Carthy, M. (2011). *Essential* [AUDIO CD]. Topic.

Cooder, R. (1995). *Music by Ry Cooder* [AUDIO CD]. Warner Brothers.

Dale, D. (2010) *Guitar Legend: the Very Best of Dick Dale* [AUDIO CD]. Shout! Factory.

Davis, M. (1969). *In A Silent Way* [AUDIO CD]. Columbia.

Davis, M. (1970). *Bitches Brew* [AUDIO CD]. Columbia.

Faulkner, N. (2012). *Write It On Your Skin* [AUDIO CD]. RCA.

Forcione, A. (2003). *Touch Wood* [AUDIO CD]. Naim.

Fripp, R. The League of Crafty Guitarists and. (1986). *Live* [AUDIO CD]. Editions EG.

Fripp, R. The League of Crafty Guitarists and. (1991). *Live II* [AUDIO CD]. Guitar Craft Services.

Fripp, R, And The League of Crafty Guitarists. (1991). *Show of Hands* [AUDIO CD]. Editions EG.

Fripp, R, The League of Crafty Guitarists. (1995). *Intergalactic Boogie Express – Live in Europe 1991*[AUDIO CD]. Discipline Global Mobile.

Frisell, B. (2018). *Music IS* [AUDIO CD]. Okeh/Sony Masterworks.

Gatton, D. (1993). *Cruisin' Deuces* [AUDIO CD]. Elektra.

Hedges, M. (1984). *Aerial Boundaries* [AUDIO CD]. Windham Hill.

Hendrix, J. (1999). *Live at Woodstock* [AUDIO CD]. MCA.

Jansch, B. (1973). *Moonshine* [AUDIO CD]. Reprise.

Jordan, S. (1985). *Magic Touch* [AUDIO CD]. Blue Note.

Jordan, S. (1988). *Flying Home* [AUDIO CD]. EMI.

Jordan, S. (1998). *Live in New York* [AUDIO CD]. Blue Note.

Jordan, S. (2008). *State of Nature* [AUDIO CD]. Mack Avenue.

Jordan, S. (2015). *Duets* [AUDIO CD]. Mack Avenue.

Kessel, B. (1981). *Solo* [AUDIO CD]. Concord Jazz.

Landreth, S. (2017). *Recorded Live in Lafayette* [AUDIO CD]. Provogue.

Leeb, T. (2007). *Desert Pirate* [AUDIO CD]. Cornford.

Linkin' Park. (2001). *Hybrid Theory* [AUDIO CD]. Warner Brothers.

Metheny, P. (2003). *One Quiet Night* [AUDIO CD]. Warner Brothers.

Mitchell, J. (1970). *Ladies of the Canyon* [AUDIO CD]. Reprise.

Montgomery, W. (1963). *Boss Guitar* [AUDIO CD]. Riverside.

Montgomery, W. (1965). *Smokin' at The Half Note* [AUDIO CD]. Verve.

Nine Inch Nails. (1994). *The Downward Spiral* [AUDIO CD]. Nothing.

Nirvana. (1991). *Nevermind* [AUDIO CD]. DGC.

Pat Metheny Group, The. (1979). *American Garage* [AUDIO CD]. ECM.

Peterson, J. (2009). *Maui on My Mind* [AUDIO CD]. Peterson Productions.

Petty, T. (1989). *Full Moon Fever* [AUDIO CD]. MCA.

Police, The. (1983). *Synchronicity* [AUDIO CD]. A&M.

Raitt, B. (1991). *Luck of the Draw* [AUDIO CD]. Capitol.

Reed, P. (2000). *Handwritten Notes* [AUDIO CD]. CandyRat.

Roche, E. (2004). With These Hands [AUDIO CD]. P3 Music.

Rolling Stones, The. (1969). *Live'r Than You'll Ever Be* [AUDIO CD]. Trademark of Quality.

Rolling Stones, The. (1969). *Let it Bleed* [AUDIO CD]. Decca.

Rolling Stones, The. (1971). *Sticky Fingers* [AUDIO CD]. Rolling Stones Records.

Vai, S. (1990). *Passion and Warfare* [AUDIO CD]. Relativity.

APPENDIX I

CD Track List – Disc 1:

Contains initial studies and preliminary improvisations

1. *12 Short Solo Studies*

2. *Etude for Two Guitars*

3. *Not That That Helps*

4. *Valentine Fog Clears*

5. *Chinese Whispers*

6. *Chromatic Attack*

7. *Babylon Bells*

CD Track List – Disc 2:

Contains final improvisations and summative piece

1. *Surf-Dale*

2. *Kotofuzz*

3. *Augmented Realism*

4. *Volcanic Waltz*

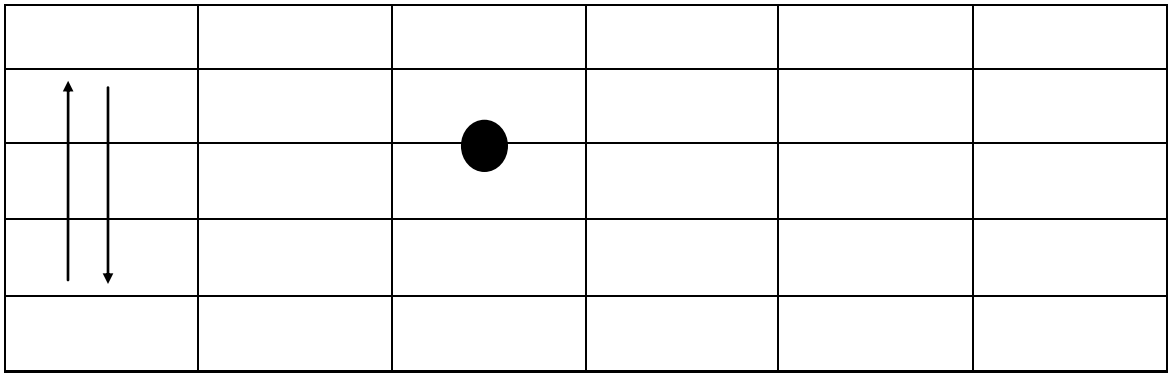
5. *All's Swell, End's Swell*

6. *Night Train to Mumbai*

7. *Twelve Constellations*

CDs of Recordings

APPENDIX II



(5)

2

Each diagram represents a birdseye view of the guitar fretboard, with the low sixth string at the bottom and the high string at the top.

The black dots represent finger positions.

The vertical arrows represent the direction the right hand moves in to execute the notes.

The horizontal arrows represent the direction the left hand moves in to execute the notes.

The number in brackets is the fret number.

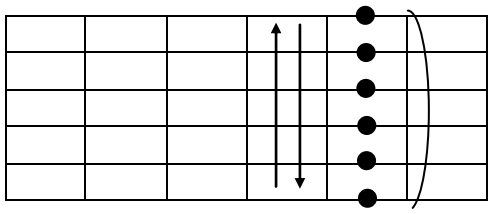
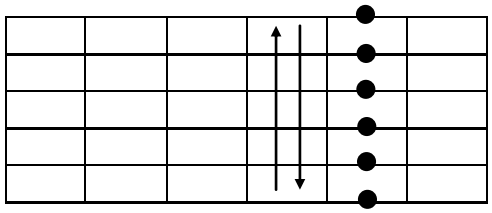
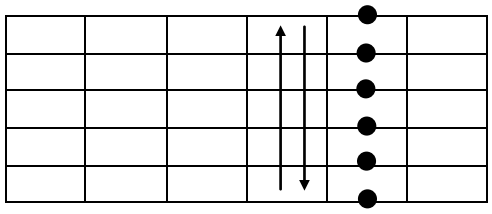
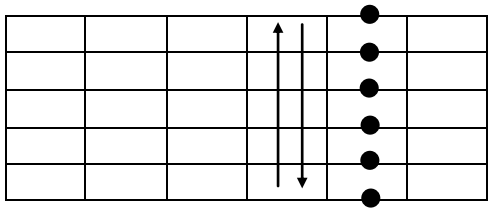
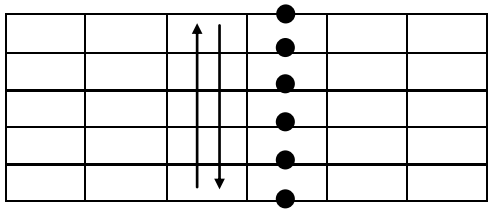
The **red** number in the bottom left is the fingering to be used, in sequence.

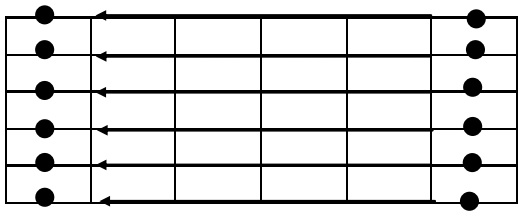
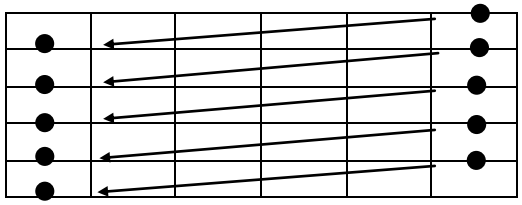
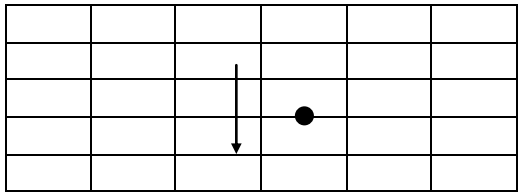
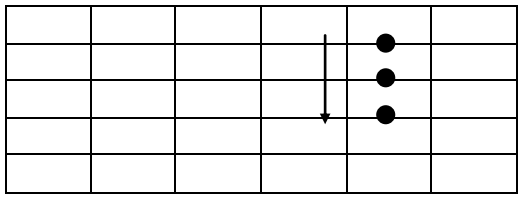
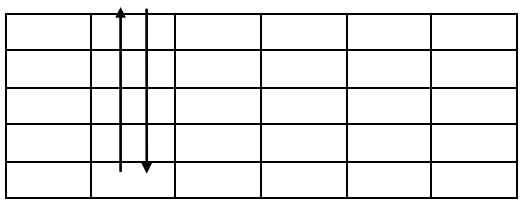
T means thumb.

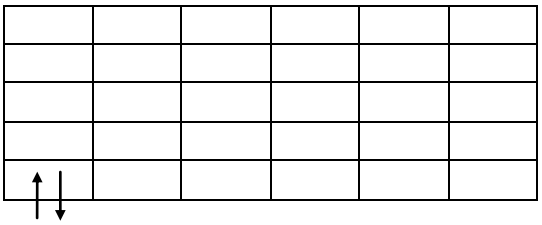
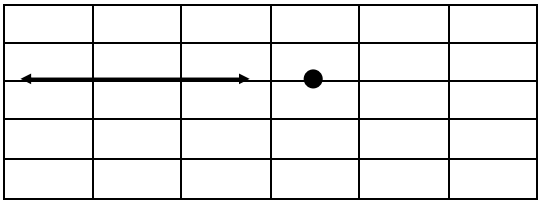
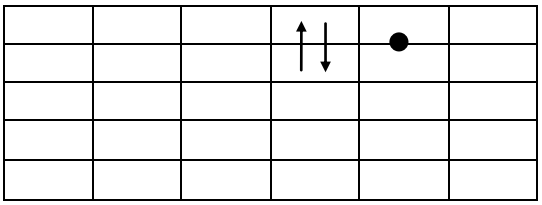
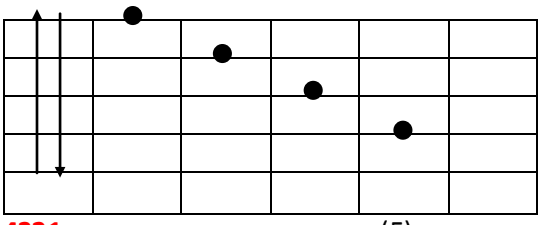
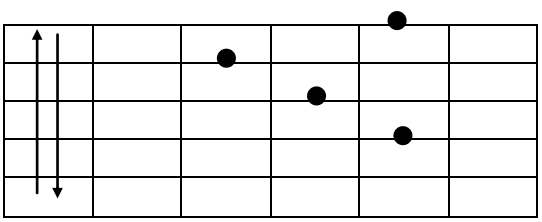
N.H. means natural harmonic (see glossary of terms)

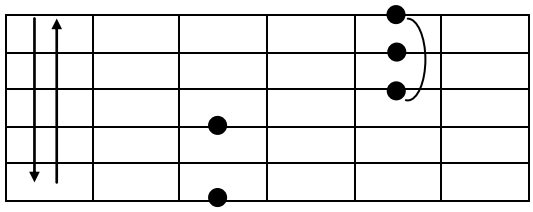
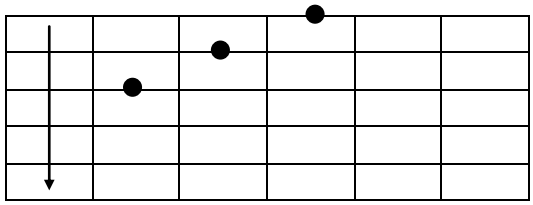
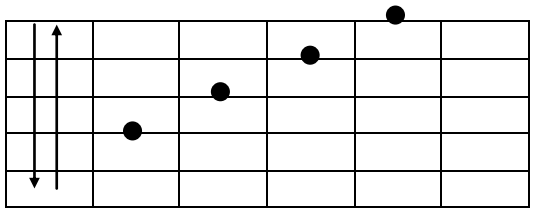
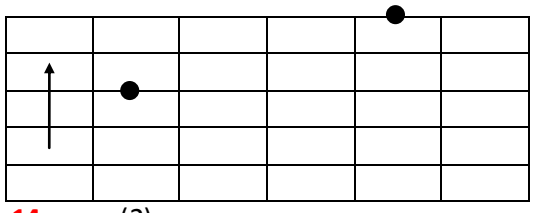
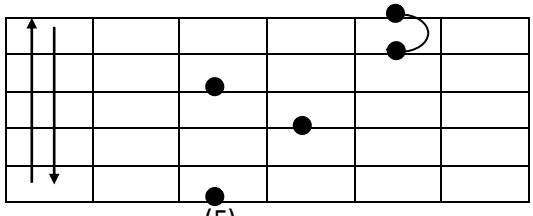
H.O. means hammer-on (see glossary of terms)

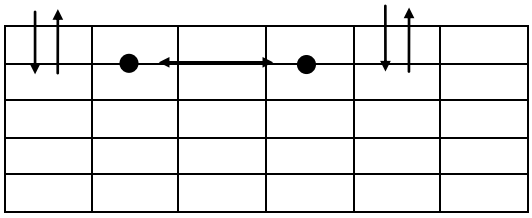
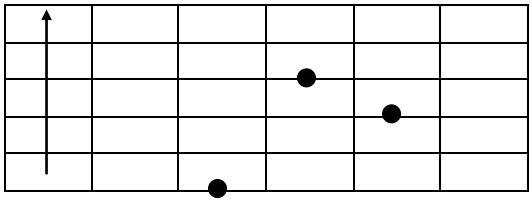
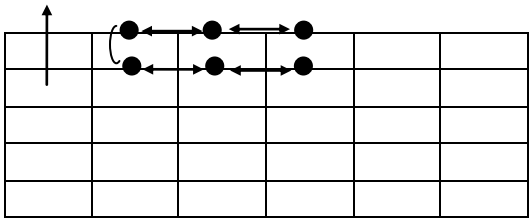
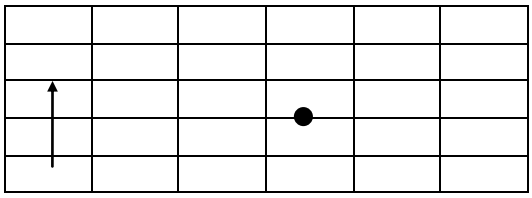
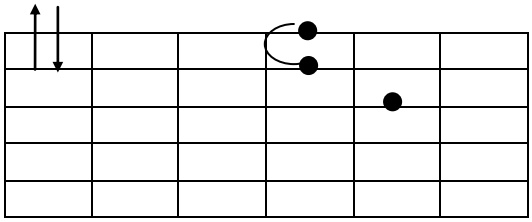
P.O. means pull-off (see glossary of terms)

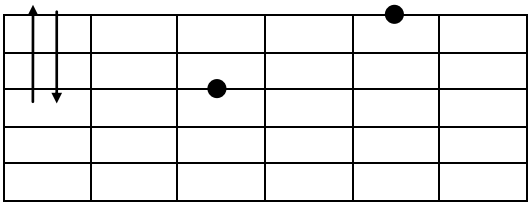
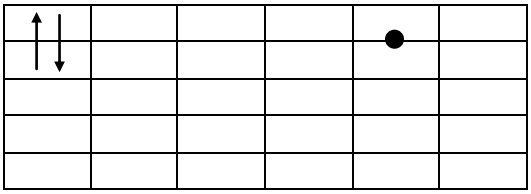
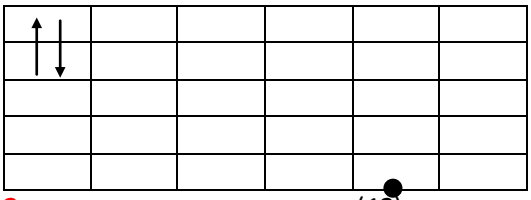
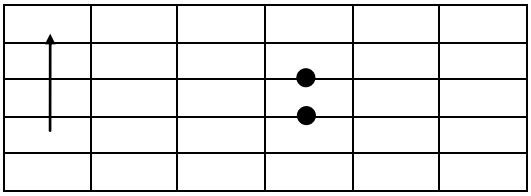
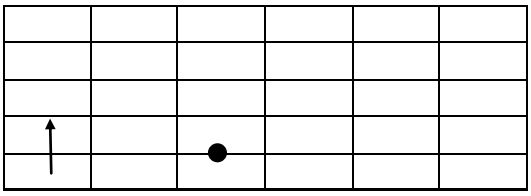
NO:	PATTERN / SHAPE DIAGRAM:	DESCRIPTION:	EXAMPLES:
1.	 (12) **111111**	Six strings barred at the 12th fret. This shape was moved around the fretboard regularly and captures the sound of the string intervals.	'Augmented Realism' (0.00-0.42).
2.	**N.H.**  **222222** (12)	The six strings executed as natural harmonics 8va higher at the 12th fret.	'Chromatic Attack' (0.42-2.16).
3.	**N.H.**  **222222** **(7)**	The six string executed as natural harmonics a compound 5th higher at the 7thh fret.	'Surf-Dale' (1.52-2.00).
4.	**N.H.**  **222222** (5)	The six strings executed as natural harmonics 15ma higher at the 5th fret.	'Chinese Whispers' (0.13-0.16).
5.	**N.H.**  **222222** (4)	The six strings executed as natural harmonics a compound 10th higher at the 4th fret. For accuracy, I used upstrokes of second finger pad.	'Chinese Whispers' (0.16-0.20).

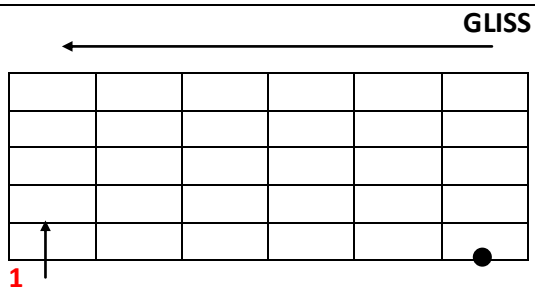
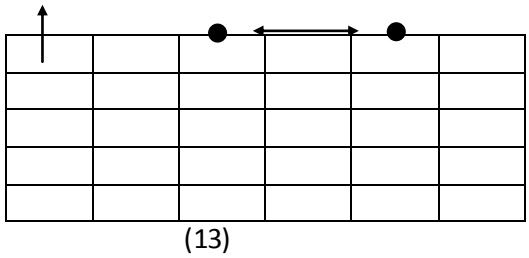
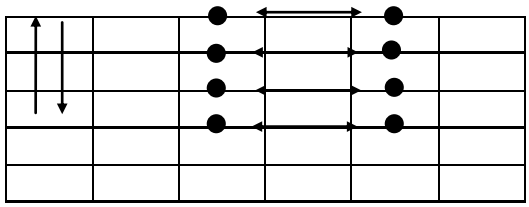
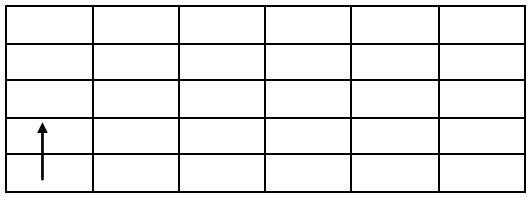
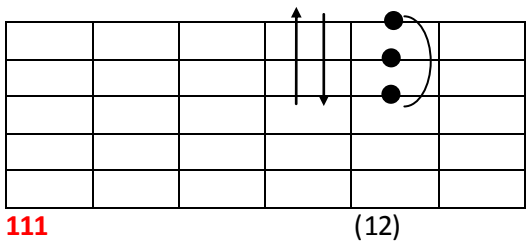
6.	**N.H.**  (7) (12) **414141414141**	Pairing the 12th and 7th natural harmonics off against one another, creating a mystical effect.	'Chromatic Attack' (2.58-3.36).
7.	**N.H.**  (7) (12) **4141414141**	Similar, this phrase crosses between strings. In both cases, careful co-ordination between the first and fourth fretting fingers is essential.	'KotoFuzz' (2.36-3.41).
8.	**N.H. w/ behind the nut bend**  **2** (4)	A N.H. with a behind the nut bend. It involves striking the string upwards with the second finger of the right hand and then pressing/releasing behind the nut.	'KotoFuzz' (0.32-0.59).
9	**N.H.**  **222** (7)	A popular triad using N.Hs used widely throughout the recordings.	'Chromatic Attack' (0.04-0.08).
10.	 **000000**	The open strings! These can be strummed, arpeggiated or used for single lines with pick, thumb or fingers.	'KotoFuzz' (0.20-0.47).

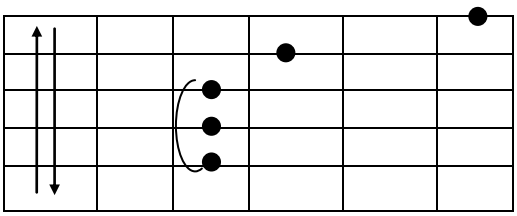
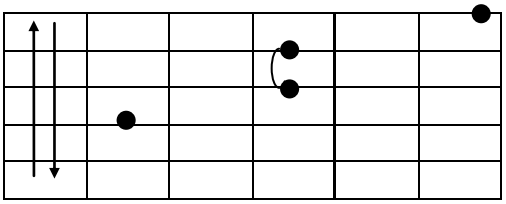
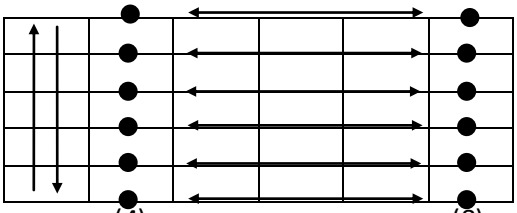
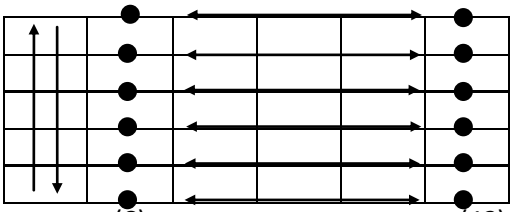
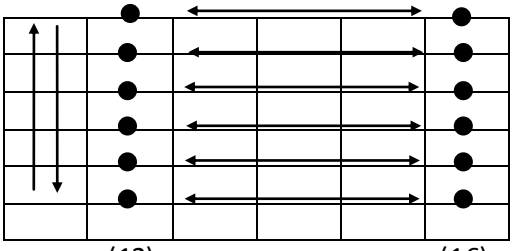
11.	 **0**	Tremolo. This was a regular technique throughout, particularly on the bass string.	'Valentine Fog Clears' (0.15-0.19).
12.	**H.O.**  (4) **02**	This is a hammer-on between the open string and fretted note, in a appoggiatura style. I experimented with different string/fret combinations.	'Night Train to Mumbai' (0.54-1.08).
13.	**N.H.**  **2** (7)	Another behind the nut bend, this time focused on the 7th fret of the B string.	'Night Train to Mumbai' (2.40-3.30).
14.	 **4321** (5)	In standard tuning, this is a popular major 7th voicing using a 4321 fingering pattern.	'Chromatic Attack' (2.57-3.25).
15.	 **3214** (5)	Similarly, this shape would be a major triad add 9 normally. The logical fingering made it an obvious choice.	'Chromatic Attack' (2.57-3.25).

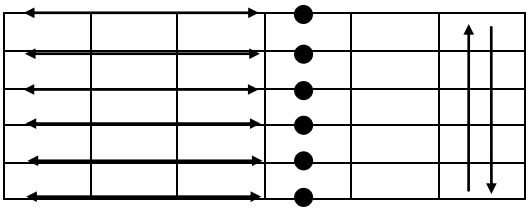
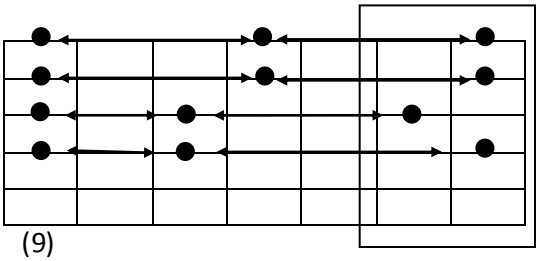
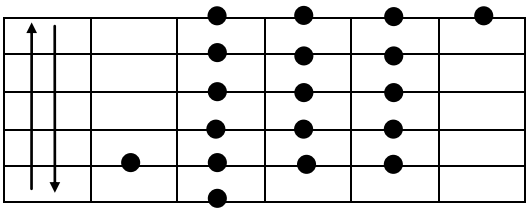
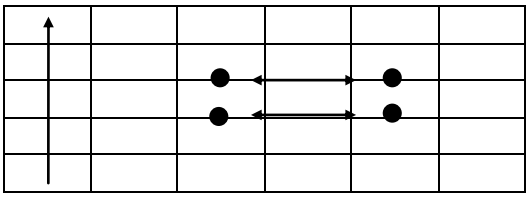
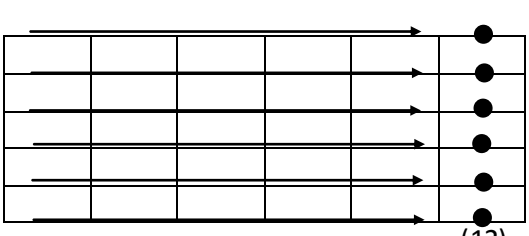
16.	 (5) **T1333**	The 13sus voicing is a favourite shape of mine in standard tuning. The parallel harmony of the top three	'All's Swell, Ends Swell' (1.56-2.09).
17.	 (12) **123**	A simple triad shape which I often used as a triple-stop lick. The slackening of the strings made this more accessible.	'Chromatic Attack' (0.10-0.15).
18.	 (2) **1234**	An extension of the above shape, this produced unison notes in regular major sevenths tuning. Great for playing melodies.	'Night Train to Mumbai' (1.42-2.30)
19.	 **14** (2)	A standard octave shape, typically using the first and fourth fingers.	'Etude for Two Guitars' (0.00-0.04).
20.	 (5) **T2144**	A minMaj13 voicing, this translated into a EbminMaj 9 - Eb+/Bb when I experimented with moving the shape around the fretboard.	'Volcanic Waltz' (4.00-5.39).

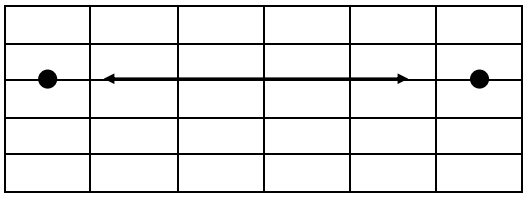
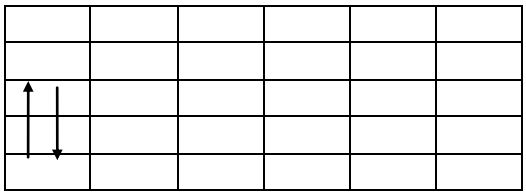
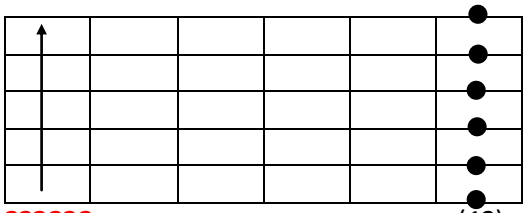
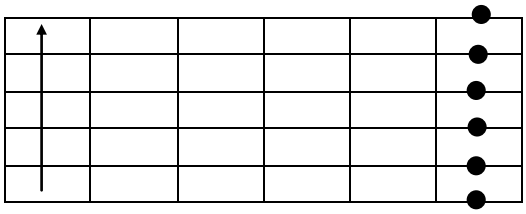
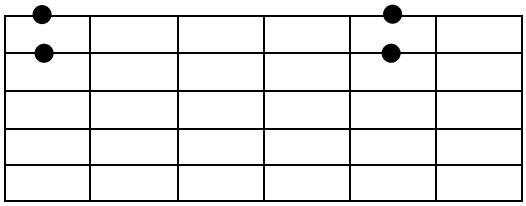
21.	 **2020** (5)	This idea alternates between the fretted notes and open string below, producing a banjo-type sound.	'Night Train to Mumbai' (0.06-0.27).
22.	 (5) **T3200**	A combination of fretted notes and open strings to construct the chord. This has a very resonant sound which I sometimes accentuate by gently shaking the guitar neck.	'Night Train to Mumbai' (0.40-0.54).
23.	 **33** (17)	Chromatic movement of dyads in this tuning created this pseudo-Hawaiian effect.	'Volcanic Waltz' (5.00-5.12).
24.	**H.O./P.O.**  **2** (4)	A forcibly played trill between the open fourth string and the fourth fretted note. I experimented with different string/note combinations.	'Chinese Whispers' (3.27-3.30).
25.	 **112** (8)	In standard tuning, this shape would be a first inversion of a major triad. In chromatic tuning this produces an octave with a b9th.	'Chinese Whispers' (1.25-2.00).

26.	 (5) **13**	Played with thumb and first finger of right hand. In chromatic tuning, this produces an interval of a 10th,	'Chromatic Attack' (0.12-0.38).
27.	**N.H.**  (12) **2**	Tremolo on the natural harmonic. Played using a light, fast alternate picking motion while holding down the respective harmonic.	'Surf-Dale' (0.27-0.34).
28.	**N.H.**  **2** (12)	Similarly, this introduces a slow movement along the string while keeping the tremolo going.	'Surf-Dale' (0.00-0.24).
29.	 (9) **23**	This voicing uses a combination of open strings and fretted notes to produce a resonant effect. I also arpepggiate these types of voicings.	'KotoFuzz' (1.56-2.32).
30.	 **2** (4)	Another behind the nut bend, using the fifth string this time.	'KotoFuzz' (1.16-1.40).

31.		A straightforward glissando in one motion, usually descending with the first finger and using a pick.	'Chinese Whispers' (0.00-0.01).
32.		A trill like this involves alternating between the two respective notes quickly using a series of hammer-ons and pull-offs.	'Valentine Fog Clears'(0.22-0.32)
33.		I used this pattern as a basis for executing fast single line runs, swapping between the first and third finger.	'Valentine Fog Clears' (0.38-0.48).
34.		Let the string ring out while de-tuning with the machine head as required. If controlled carefully, the string can be brought back to pitch.	'Not That That Helps' (9.41-9.46).
35.		A tremolo across three strings. In this case, I used my right hand fingernails to brush the strings for a softer tone to a pick.	'Not That That Helps' (3.38-10.01).

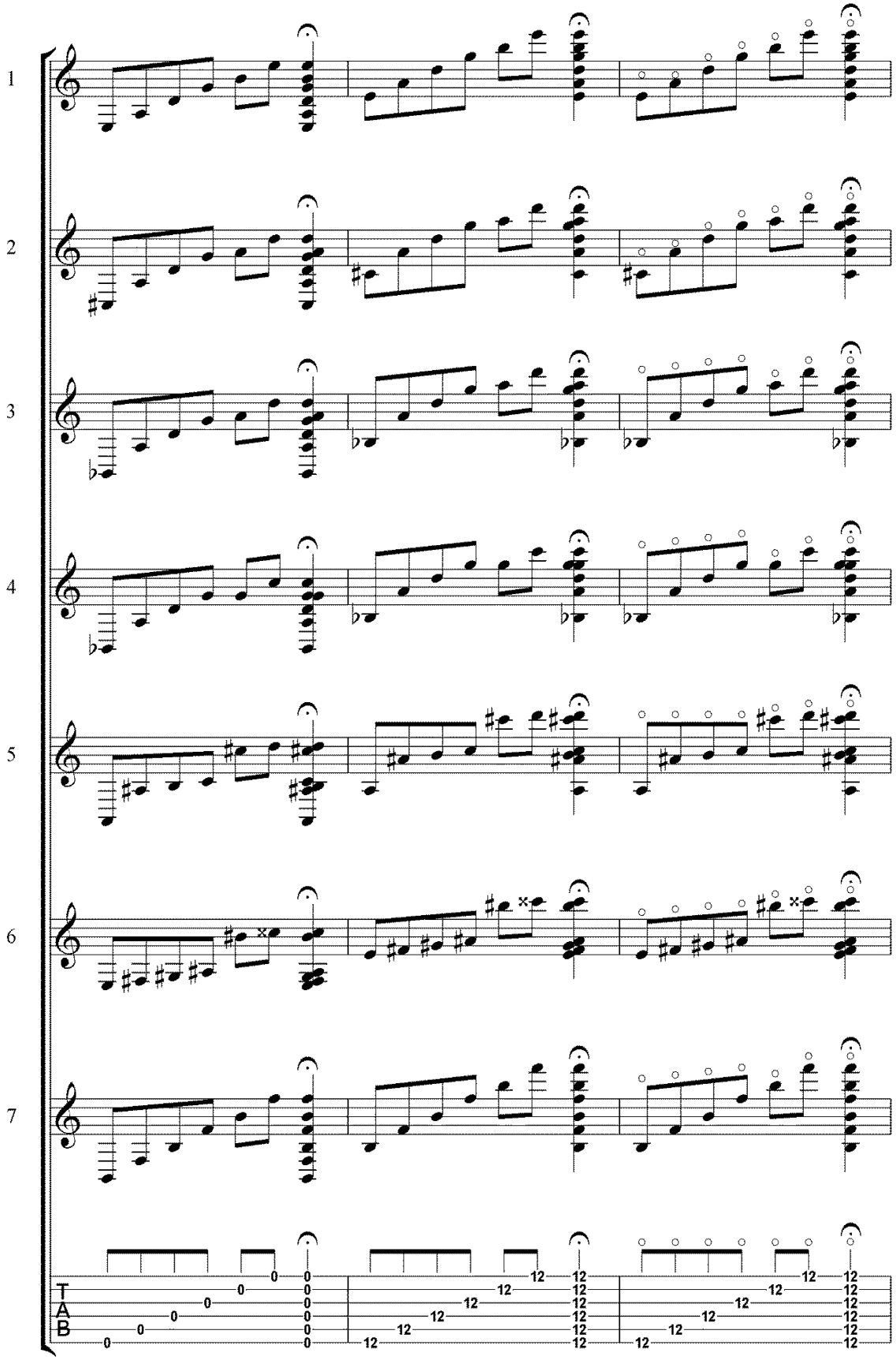
36.	 **11124** (11)	Usually played with a pick and fairly close to the neck pick up for a harp-like sound. I find the shape of the voicing assists intonation.	'Etude for Two Guitars' (0.04-0.11).
37.	 (2) **141414**	A more challenging voicing due to the finger spacing required. It is inspired in part by Allan Holdsworths's chordal work.	'Etude for Two Guitars' (0.24-1.14).
38.	 (4) (8) **141414141414**	Similarly, the finger spacing in this single line pattern is extreme but effective in accessing the desired sound.	'Augmented Realism' (all lead lines throughout the piece used this pattern)
39.	 (8) (12)	See above.	'Augmented Realism' (all lead lines throughout the piece used this pattern)
40.	 (12) (16)	See above.	'Augmented Realism' (all lead lines throughout the piece used this pattern)

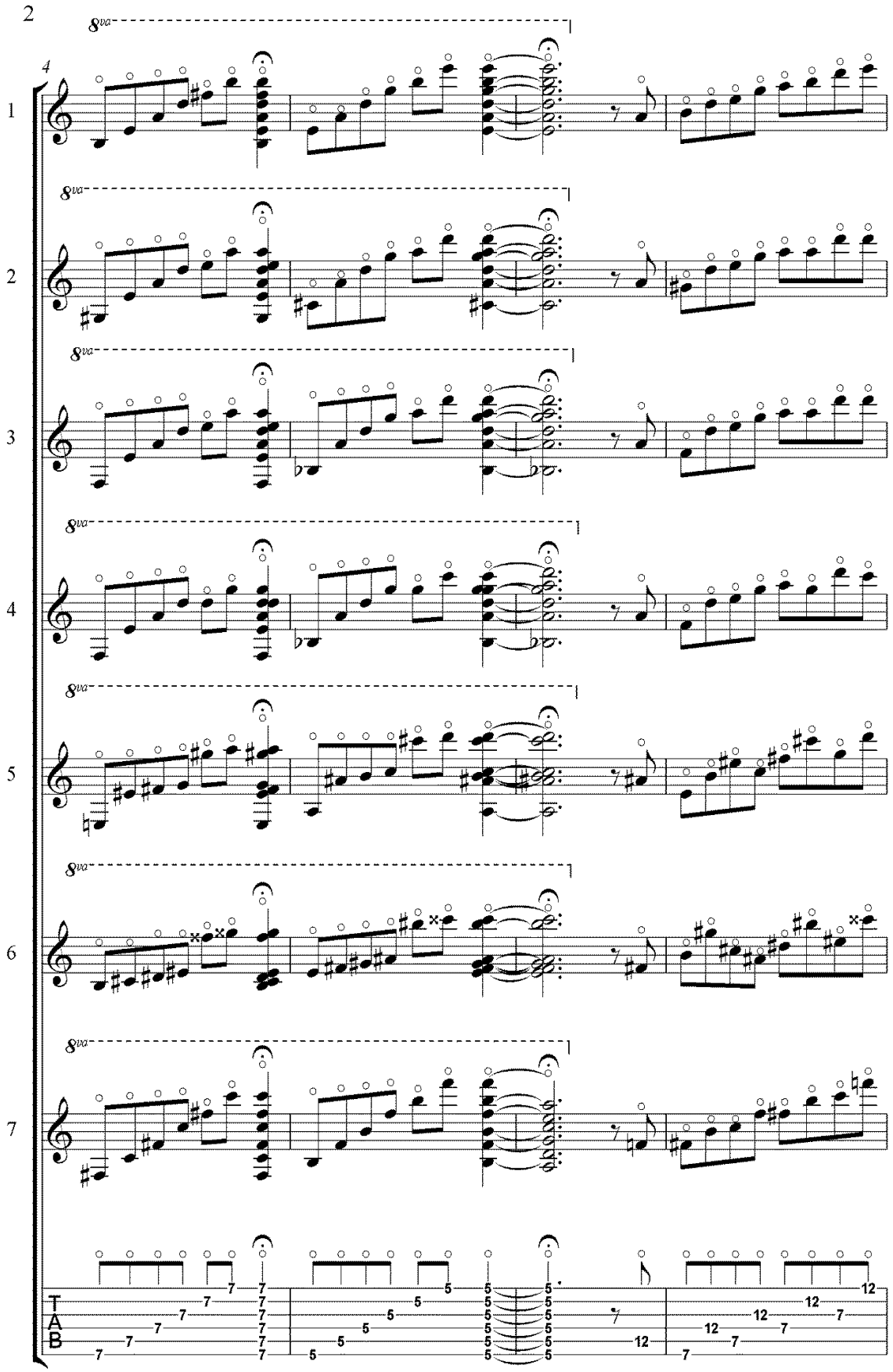
41.	 **040404040404** (4)	A variation of diagrams 38-40, using open strings and the fourth fret.	'Augmented Realism' (all lead lines throughout the piece used this pattern)
42.	 (9) **13131313 w/ right hand 2 as required**	This is the basic pattern to a finger-tapping lick I often play, inspired by Stanley Jordan. The right hand finger taps the notes in the box.	'Etude for Two Guitars' (6.15-6.50).
43.	 **212331231231231233** (12)	This is a very fast run/lick I often use in standard tuning which involves slurring the notes together.	'Etude for Two Guitars' (1.37-1.39).
44.	 (9) (11) **11**	Sliding double string lick often associated with parallel fourths in standard tuning. This timbrally worked well.	'Etude for Two Guitars' (2.05-2.07).
45.	**H.O.**  (12) **222222**	This phrase involved playing the open string quickly followed by a hammer-on to the 12th fret.	'Twelve Constellations' (0.42-0.44).

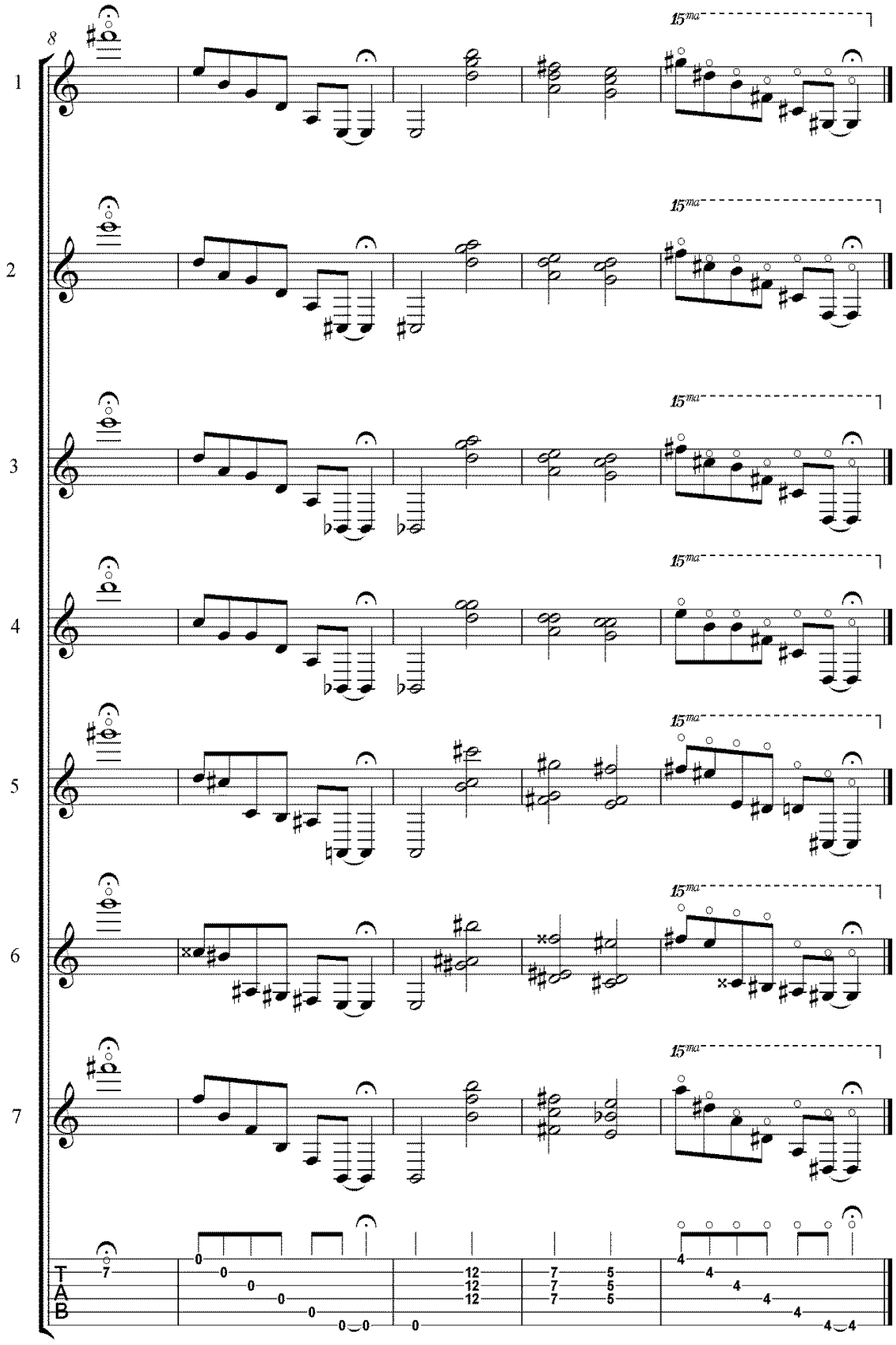
46.	 **2**	Classical vibrato, playing a melody on one string only.	'Twelve Constellations' (2.22-4.22).
47.	 **0**	A tremolo in the mid-range using alternate picking. This works both as a background texture and foreground single line (can open/ fretted).	'Twelve Constellations' (0.25-0.35).
48.	**N.H. W/ VOLUME SWELL**  **222222** (12)	Natural harmonic with volume swell, 12th fret.	'KotoFuzz' (2.00-2.05).
49.	**N.H. W/ VOLUME SWELL**  **222222** (7)	Natural harmonic with volume swell, 7th fret.	'KototFuzz' (1.42-1.57).
50.	 (12) (16) **1414**	Another variation on an earler pattern, used for very fast lick played using a quick repetitive finger motion between the first and fourth fingers.	'Augmented Realism' (2.33-2.38).

APPENDIX III

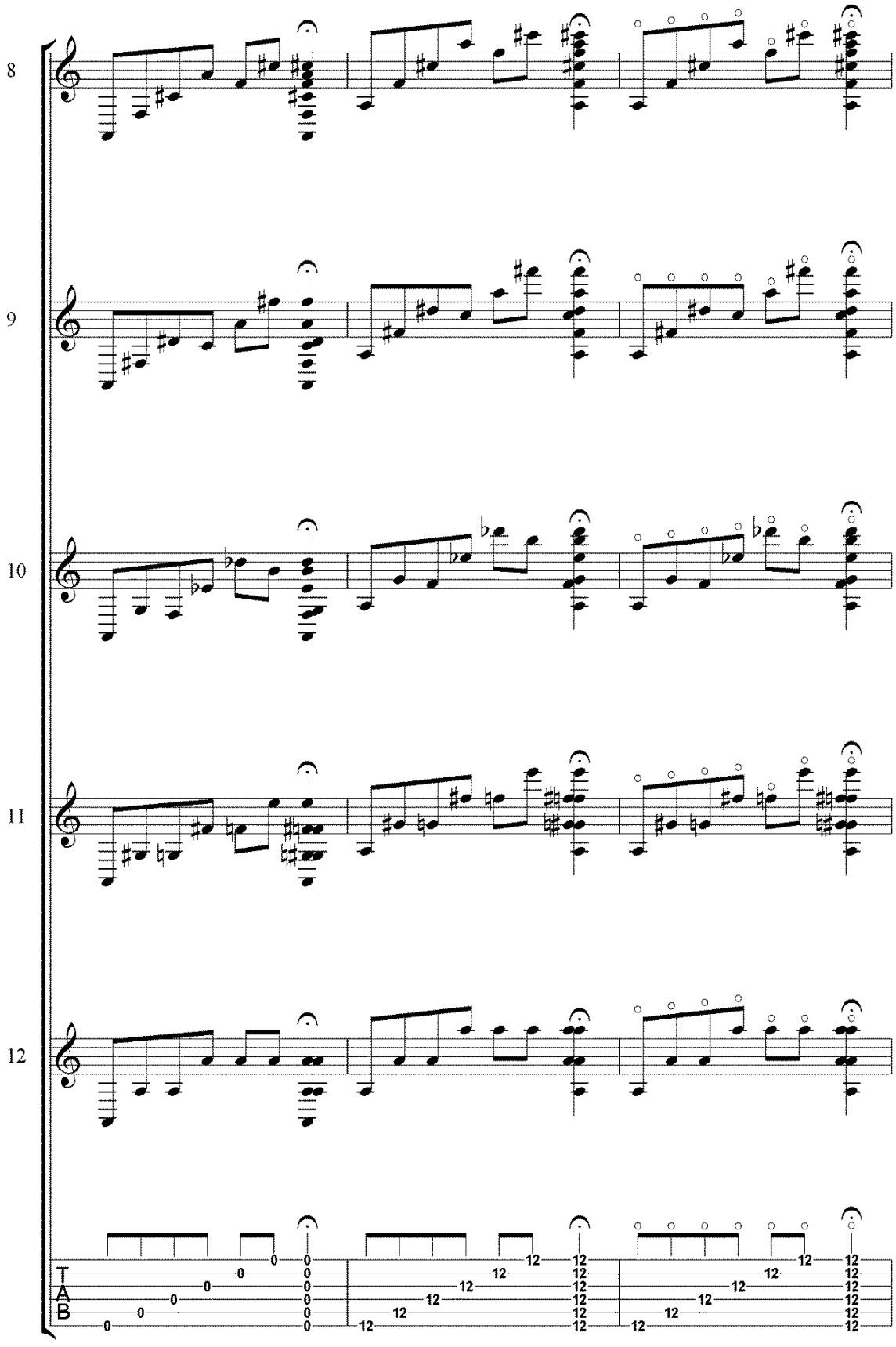
12 Short Solo Studies (Tunings 1-7)

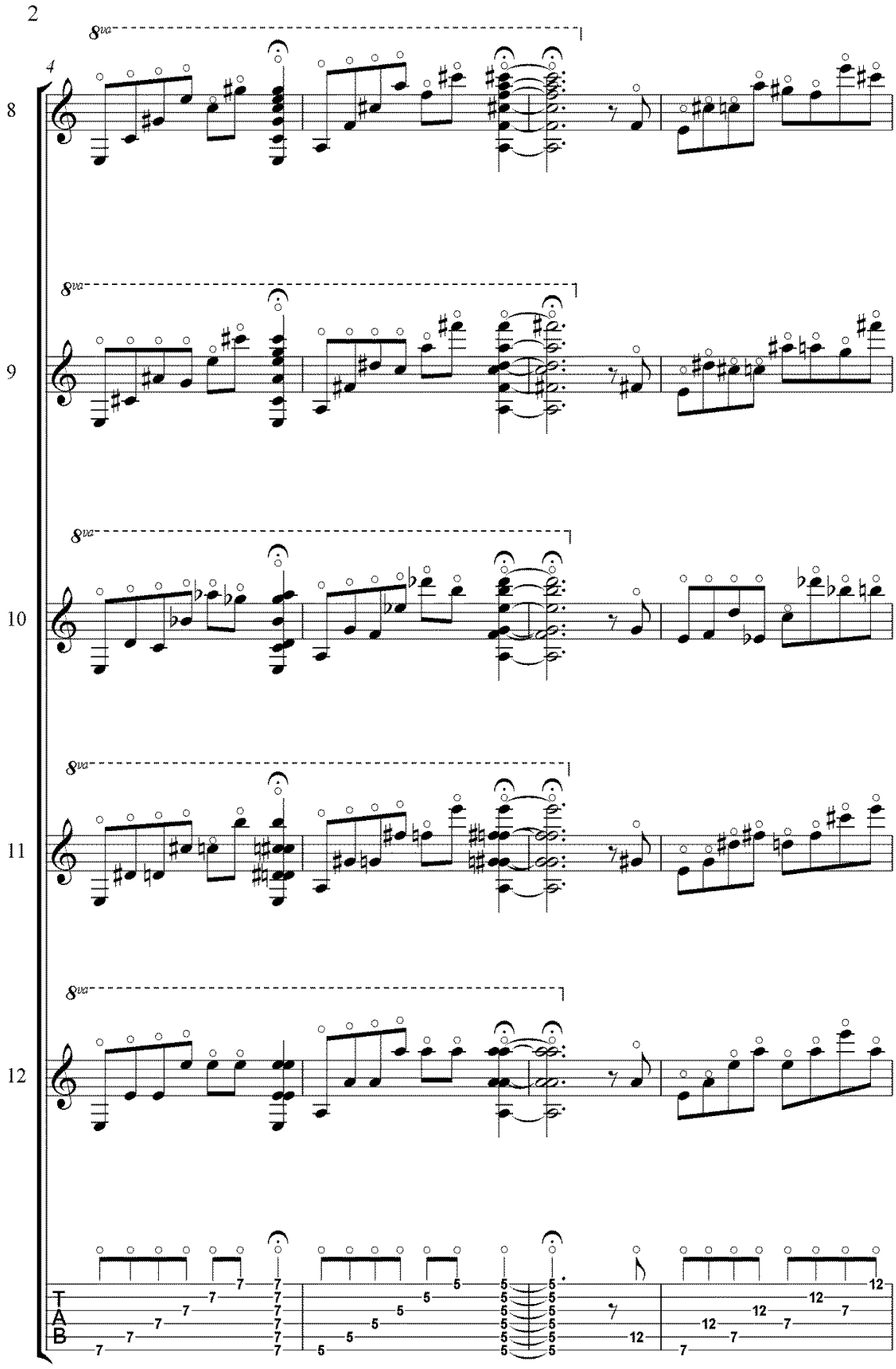


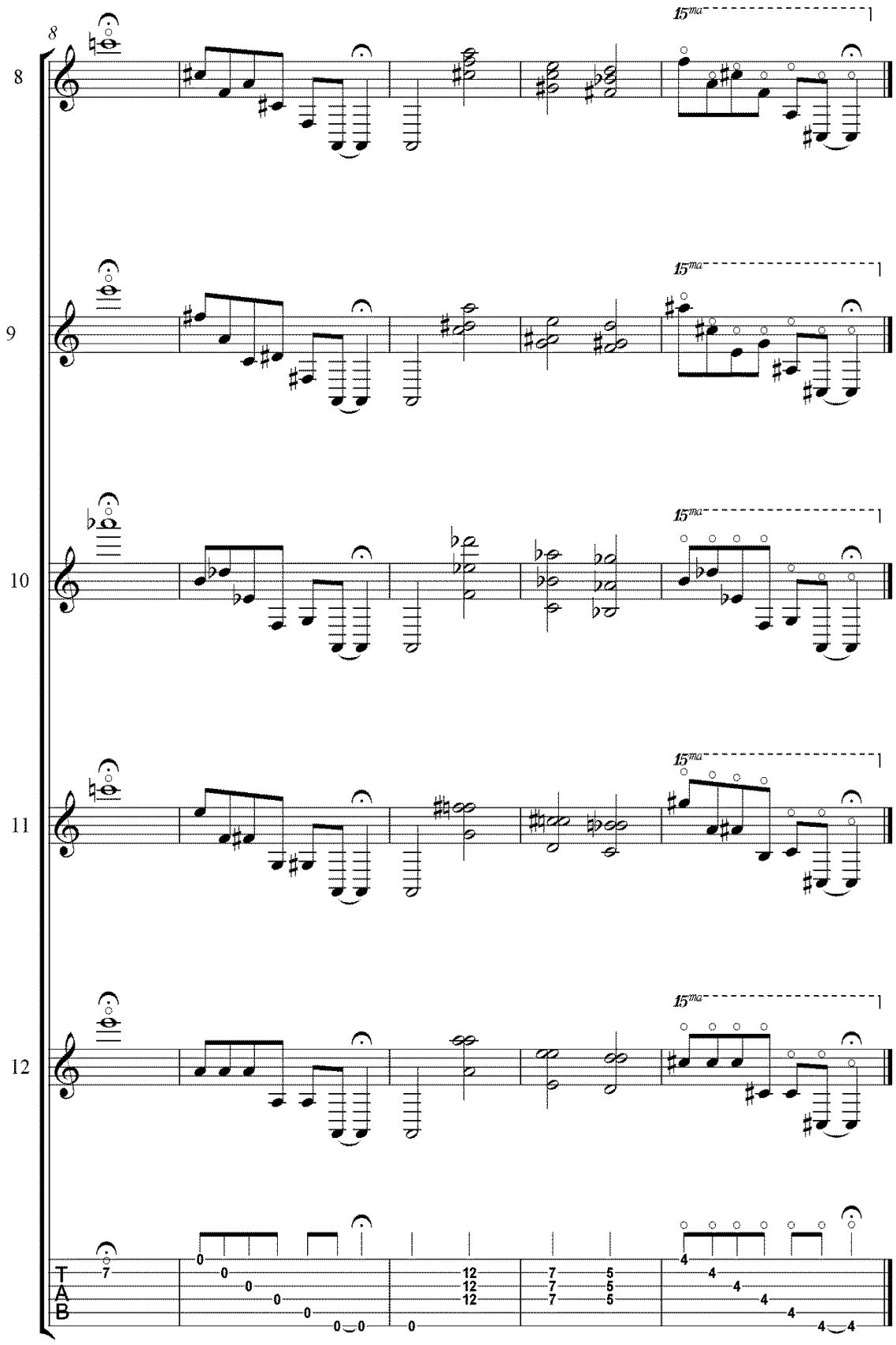

2
4
1
2
3
4
5
6
7
8va
T
A
B


8
15ma
1
2
3
4
5
6
7
T
A
B

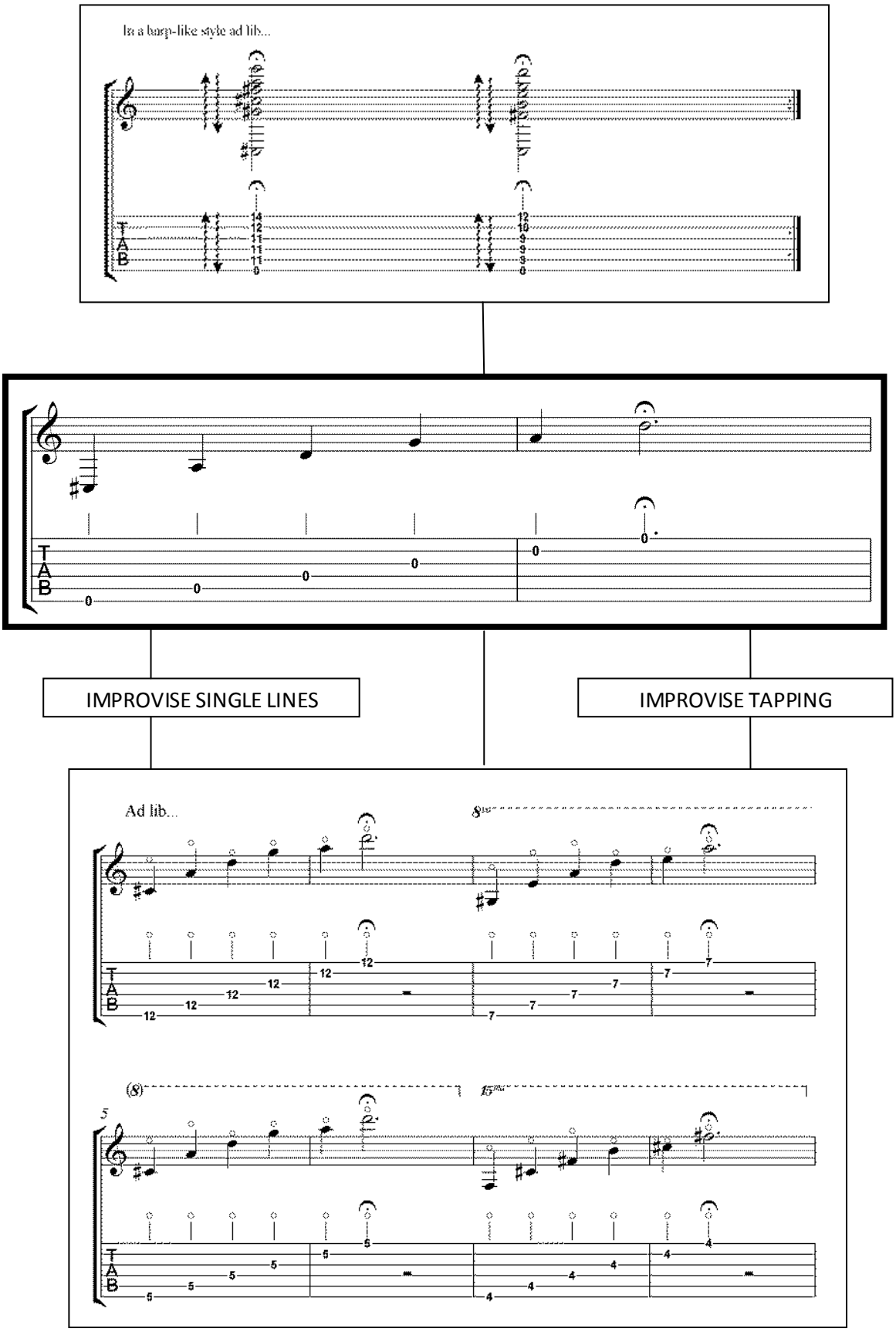
12 Short Solo Studies (Tunings 8-12)

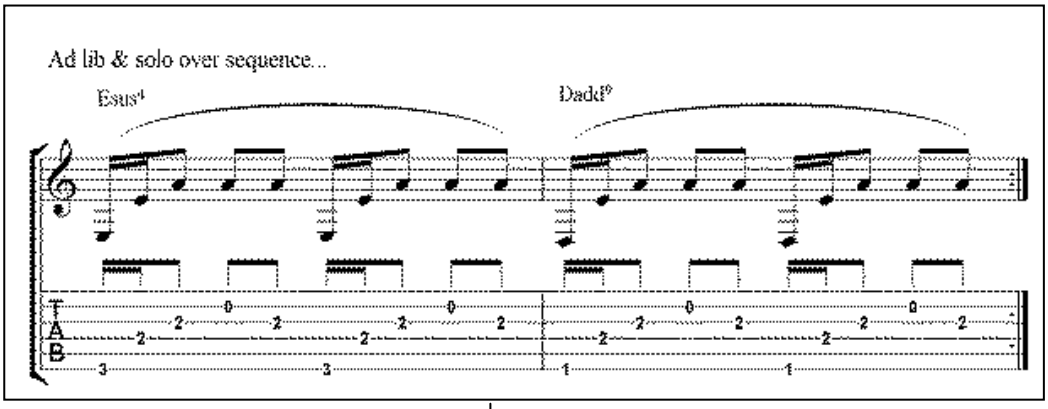


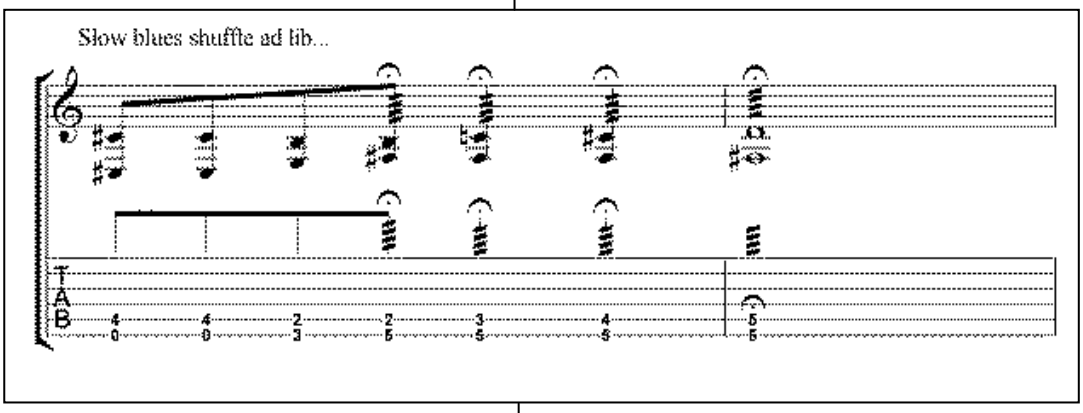

2
4
8va
8
9
10
11
12
T
A
B

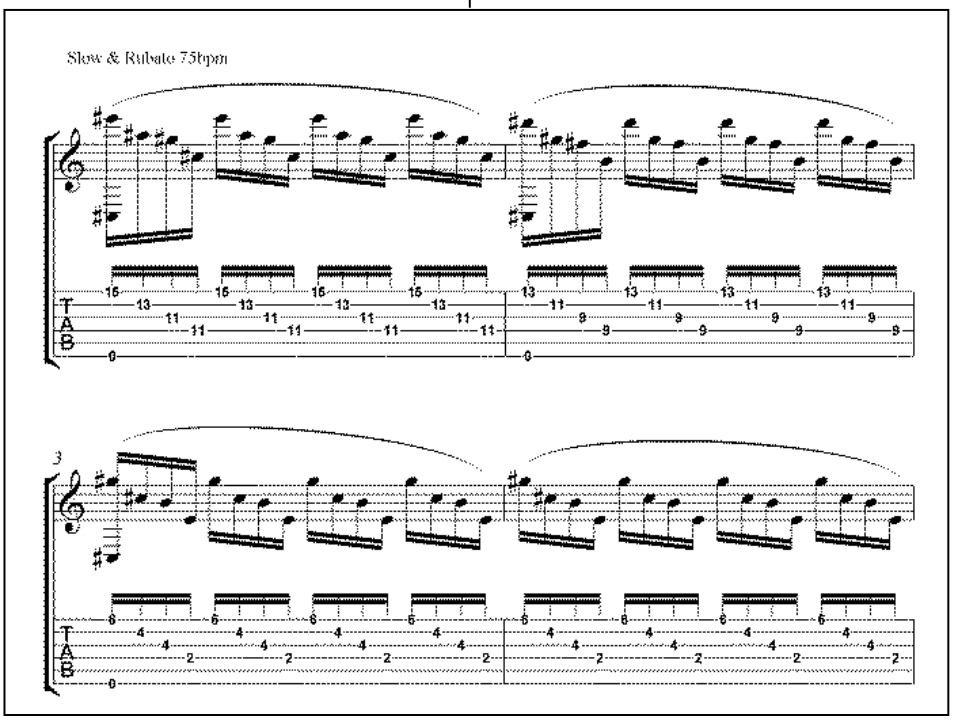

8
8
15ma
9
15ma
10
15ma
11
15ma
12
15ma
T
A
B

‘Etude for Two Guitars’ C#ADGAD Tuning

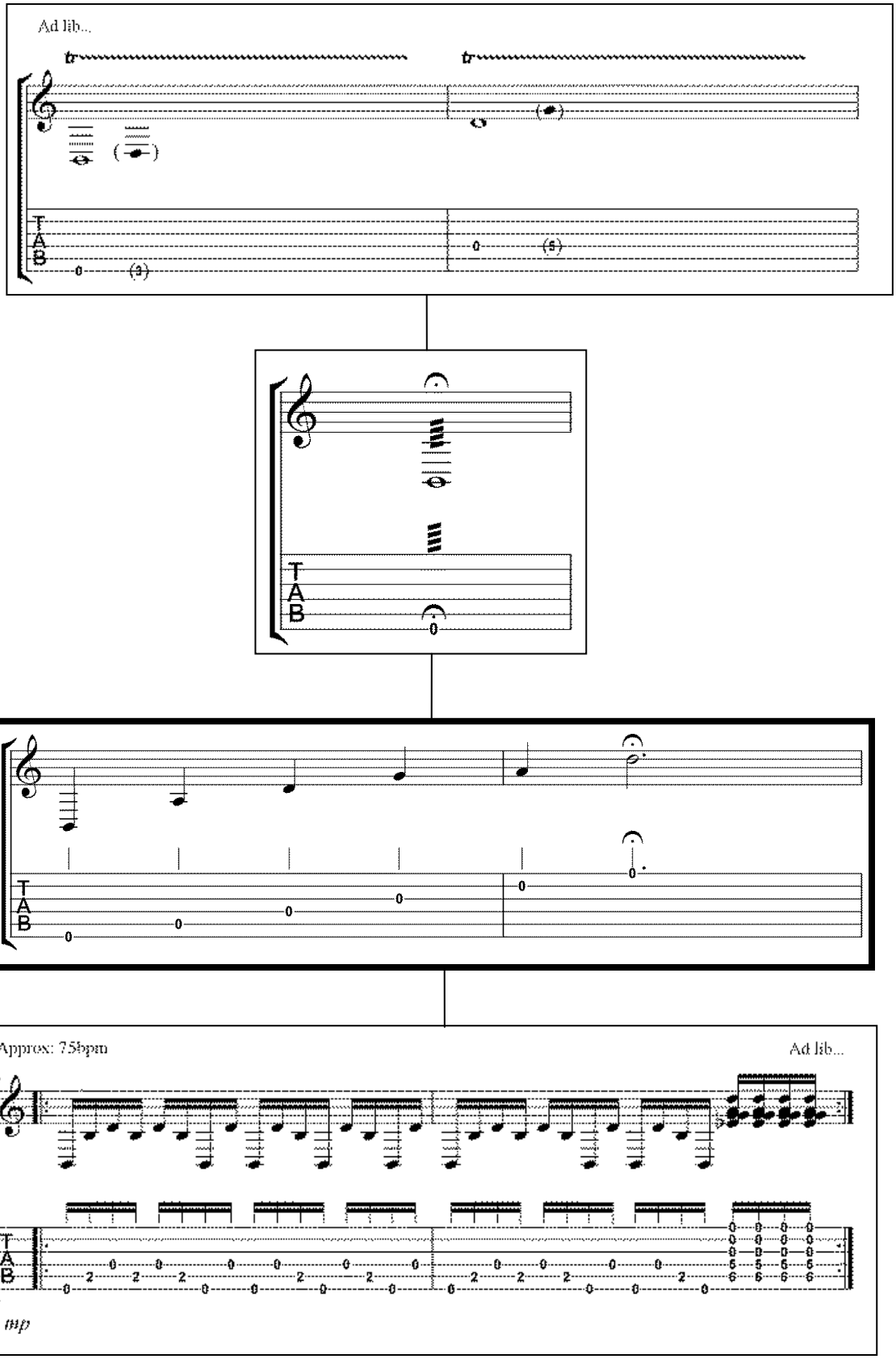



Ad lib & solo over sequence...
Esus4
Dadd9

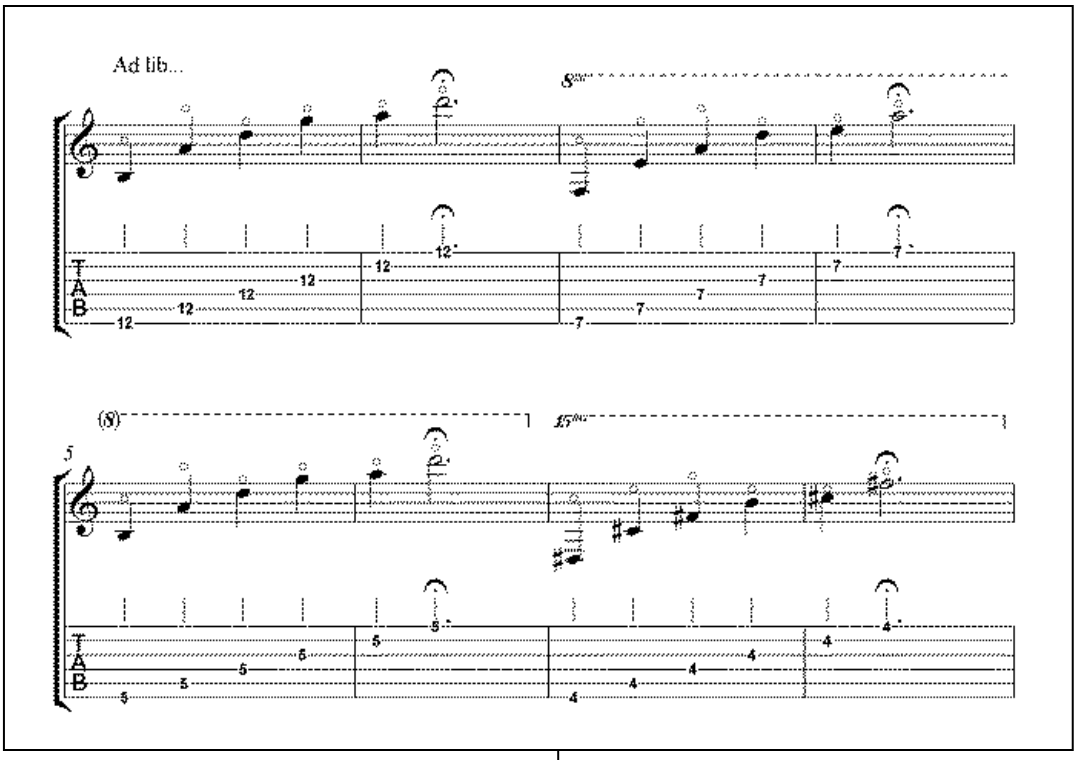

Slow blues shuffle ad lib...

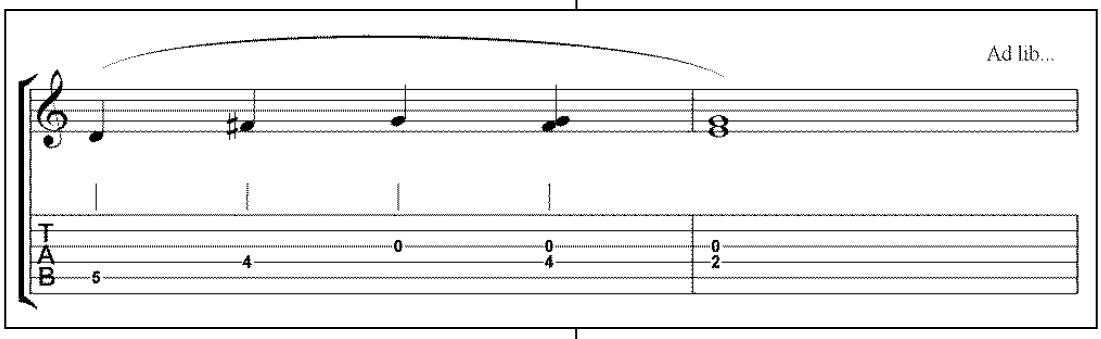

Slow & Rubato 75bpm

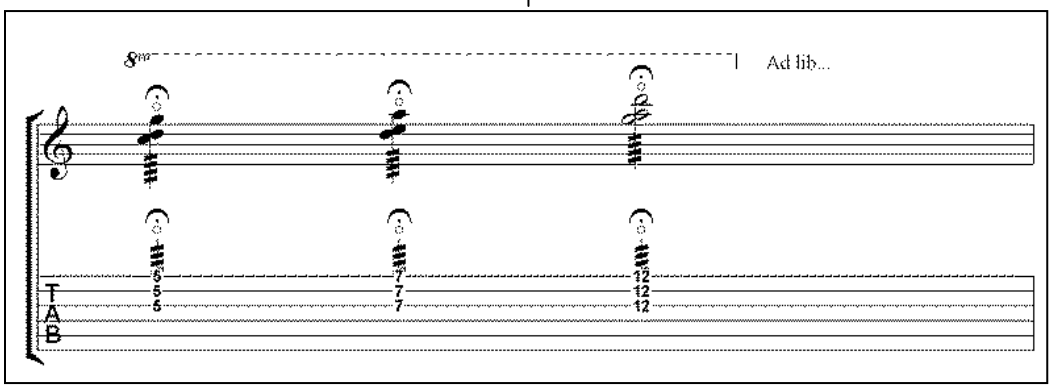
‘Not That That Helps’ BADGAD Tuning



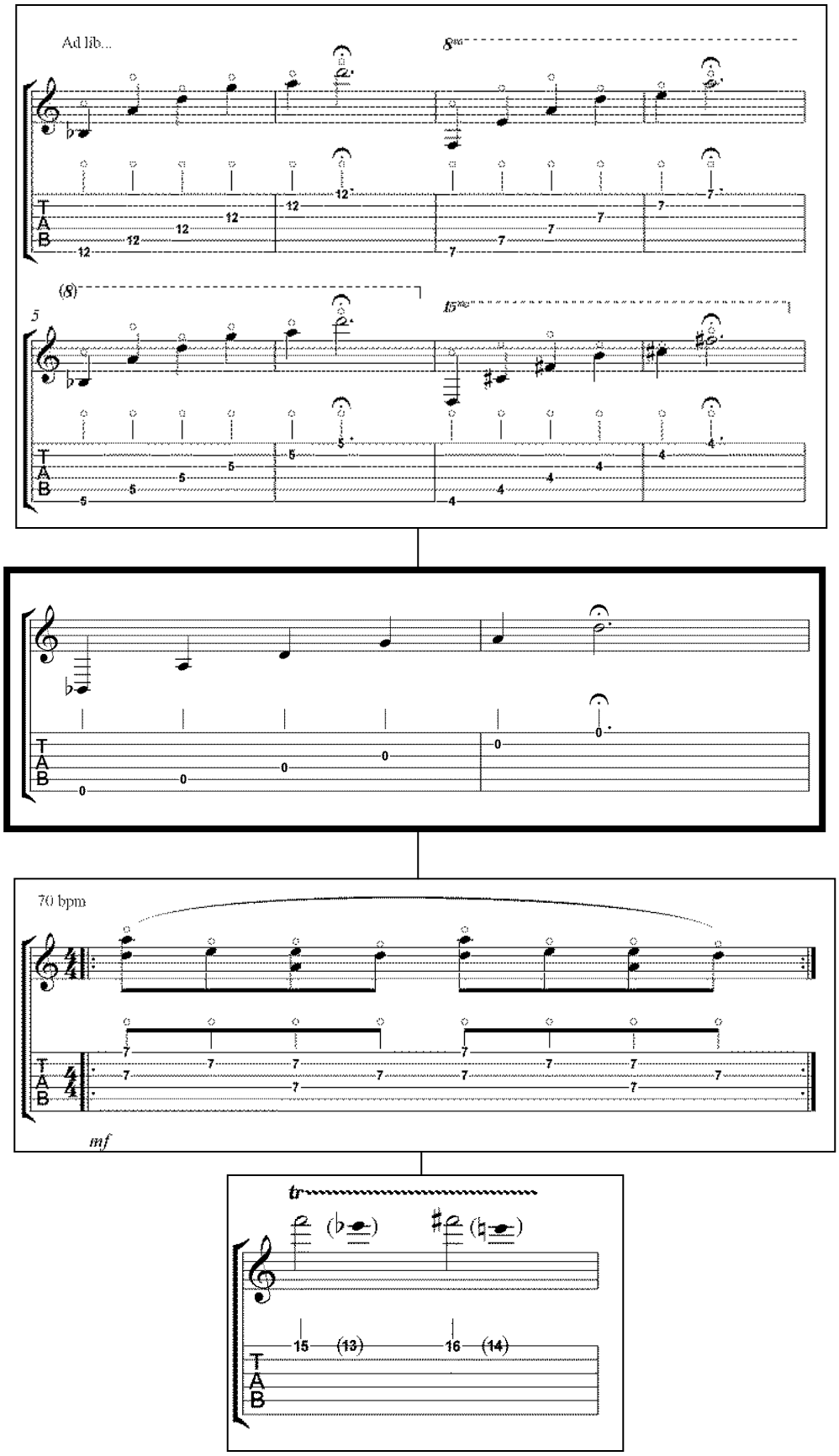
'Not That That Helps' P2



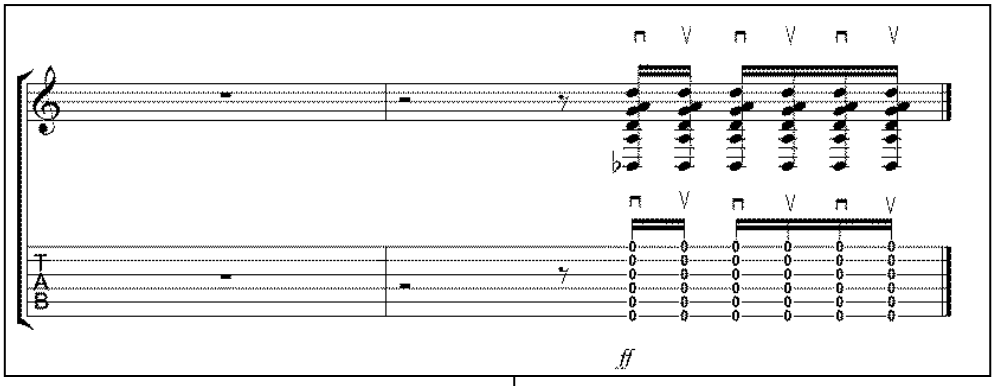


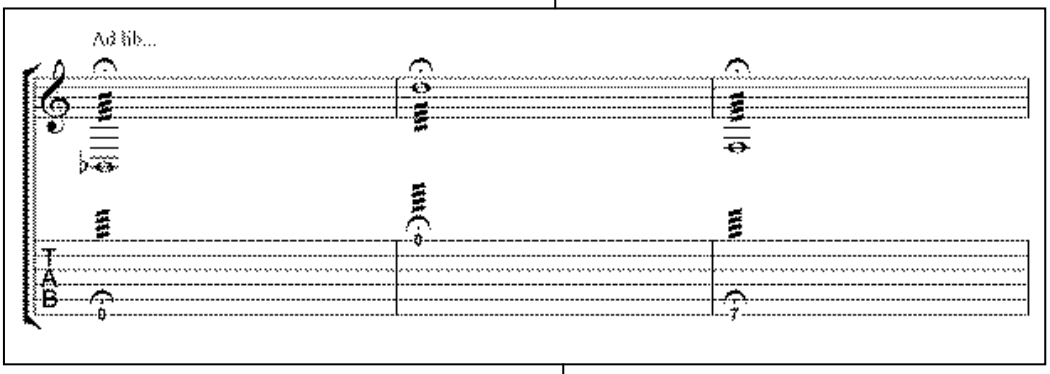


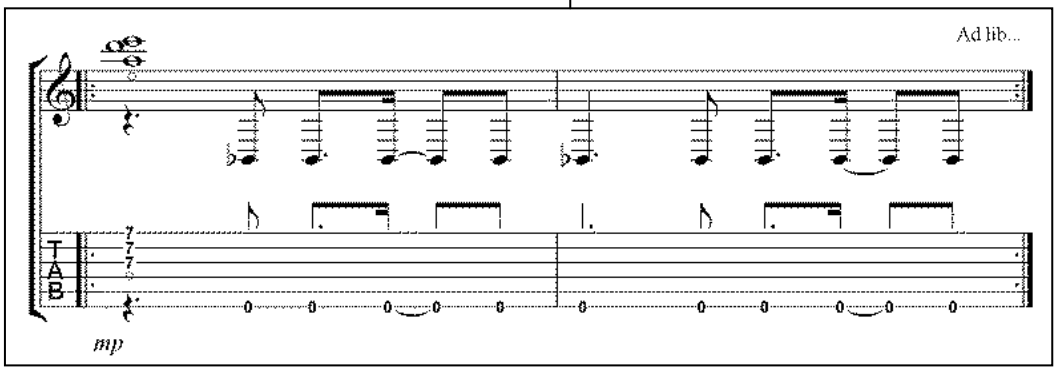
‘Valentine Fog Clears’ BbADGAD Tuning



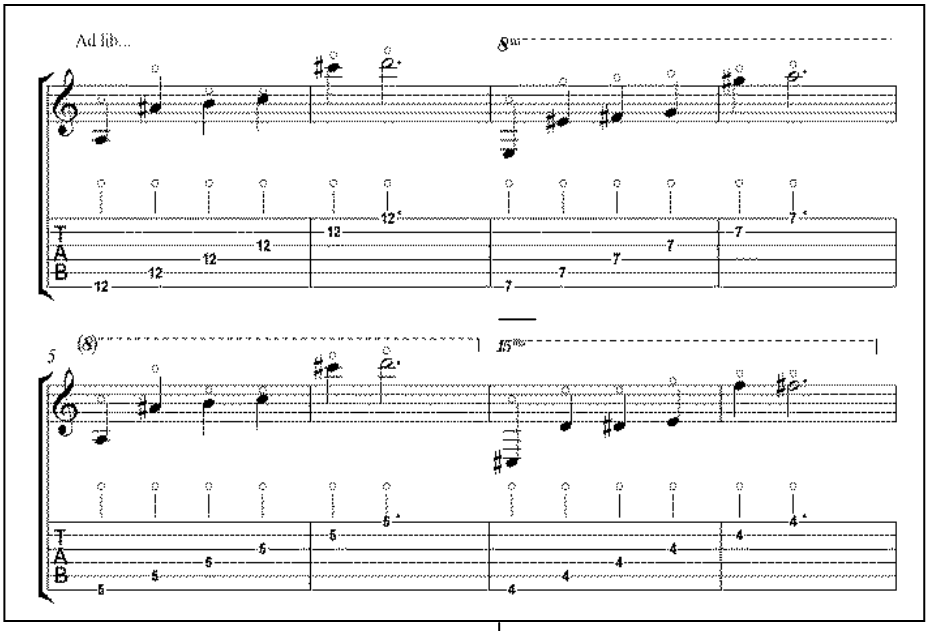
‘Valentine Fog Clears’ P2

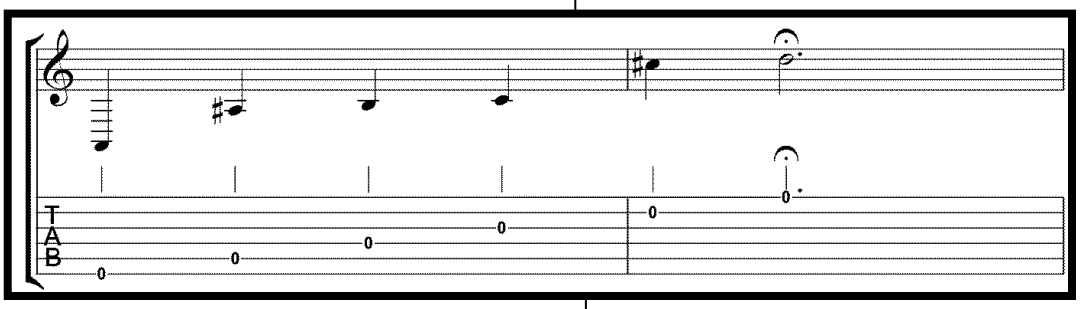


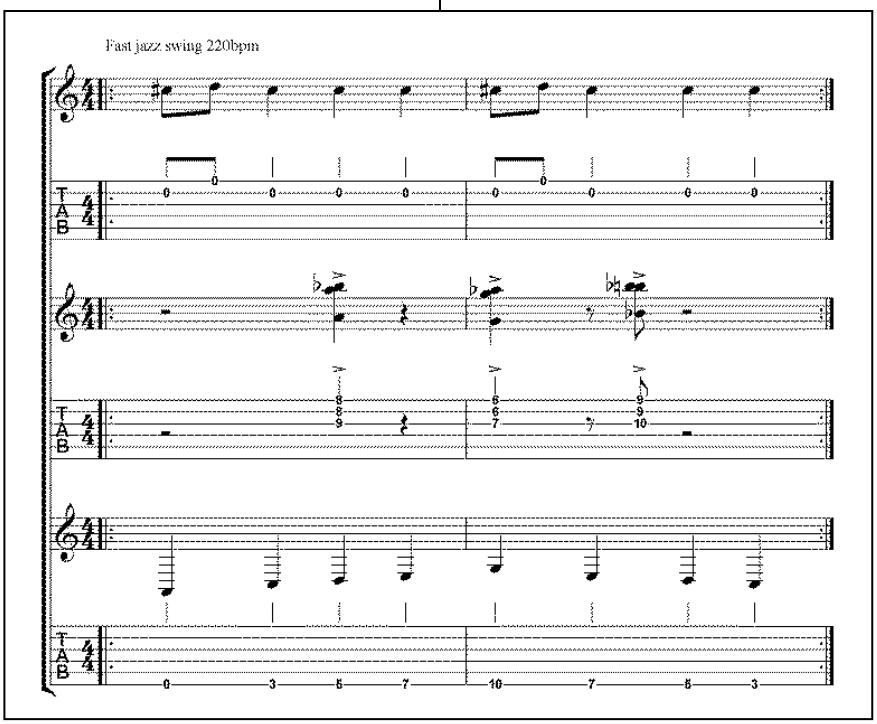




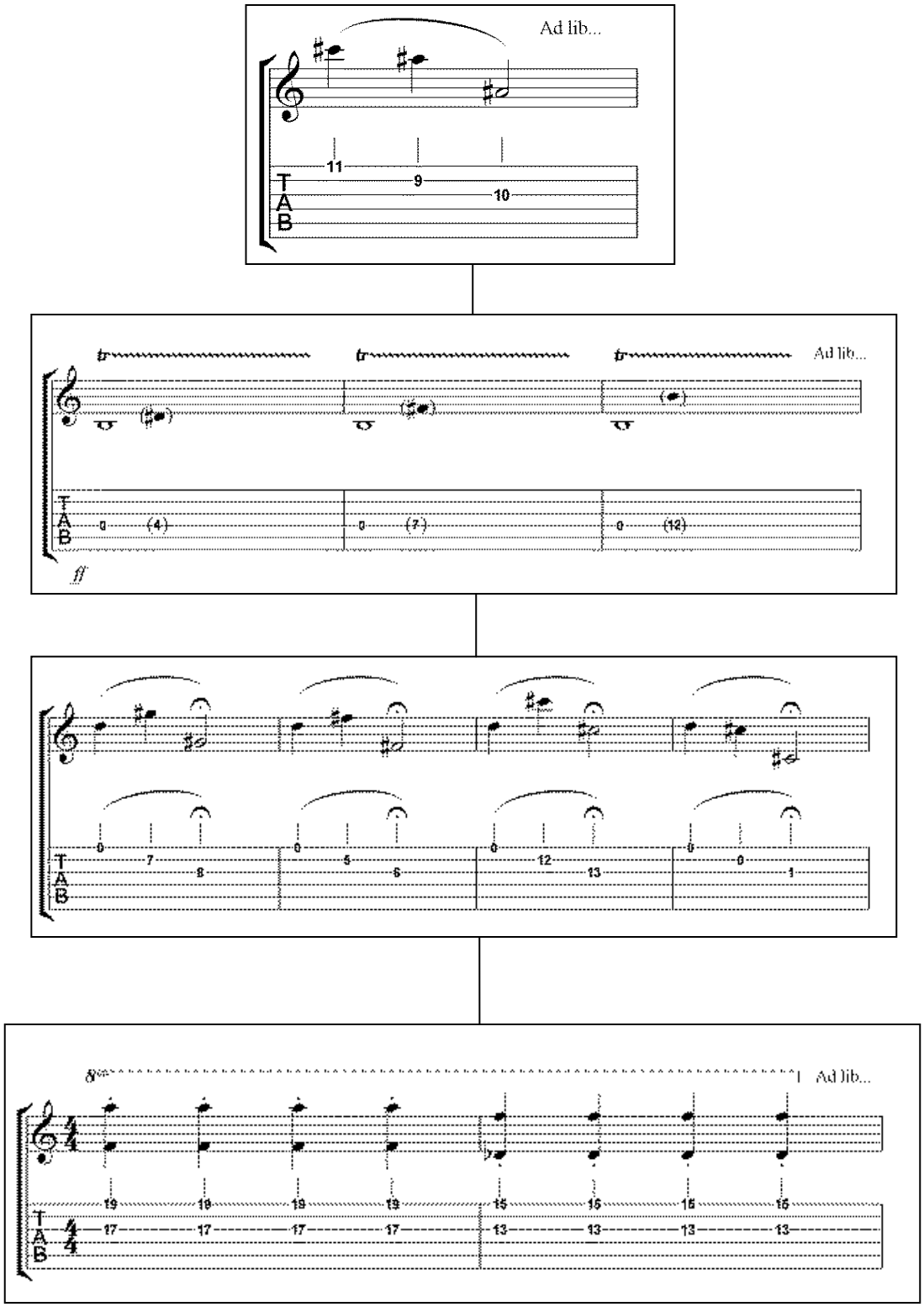
‘Chinese Whispers’ AA#BCC#D Chromatic Tuning



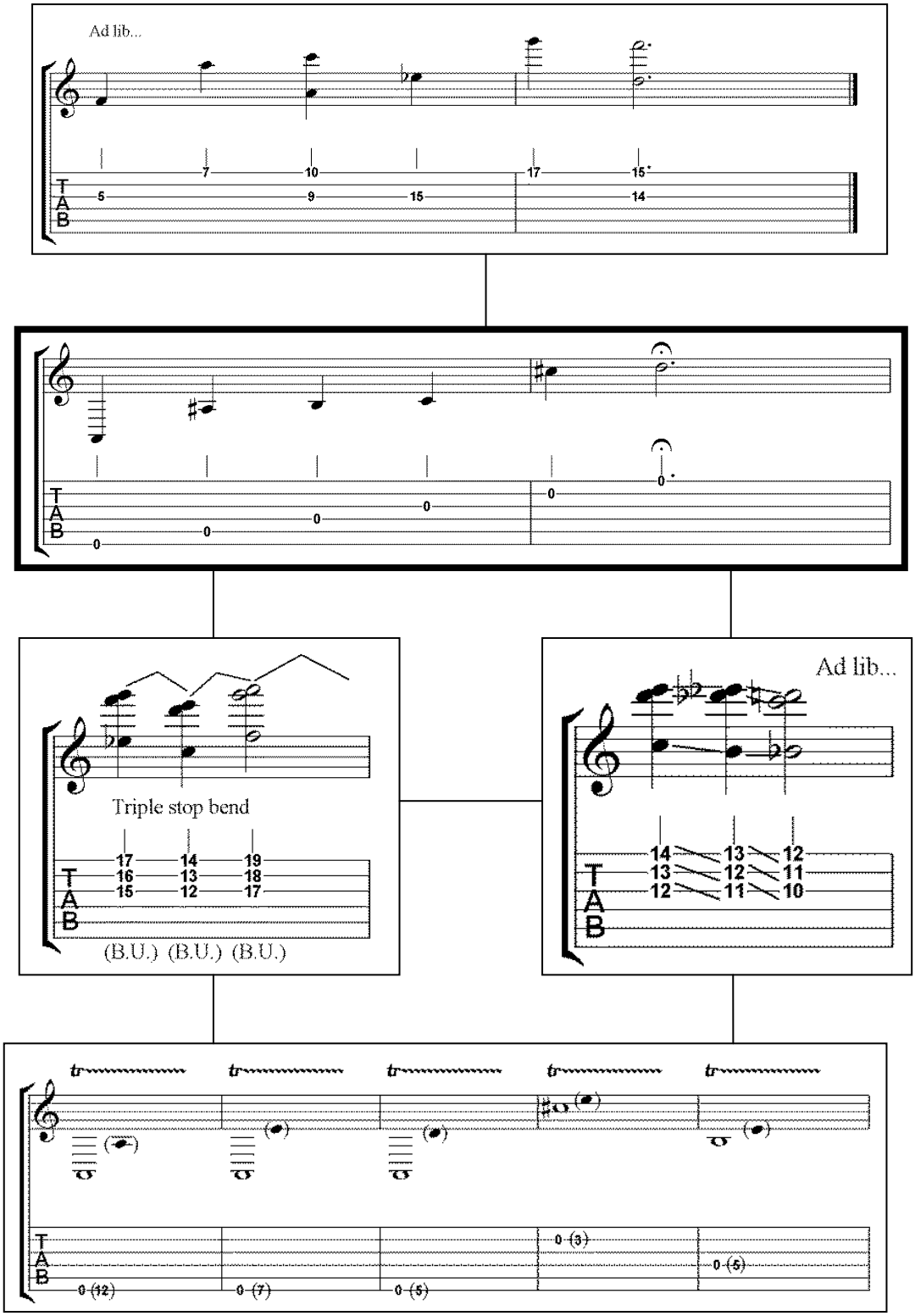




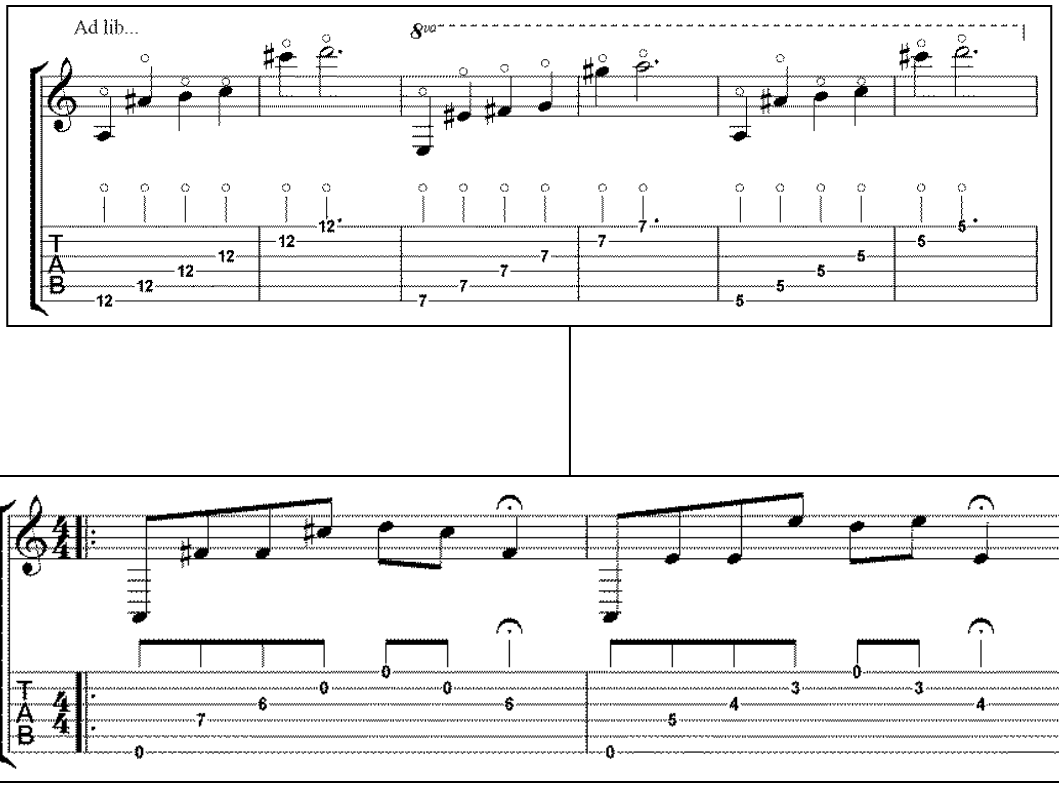
‘Chinese Whispers’ P2



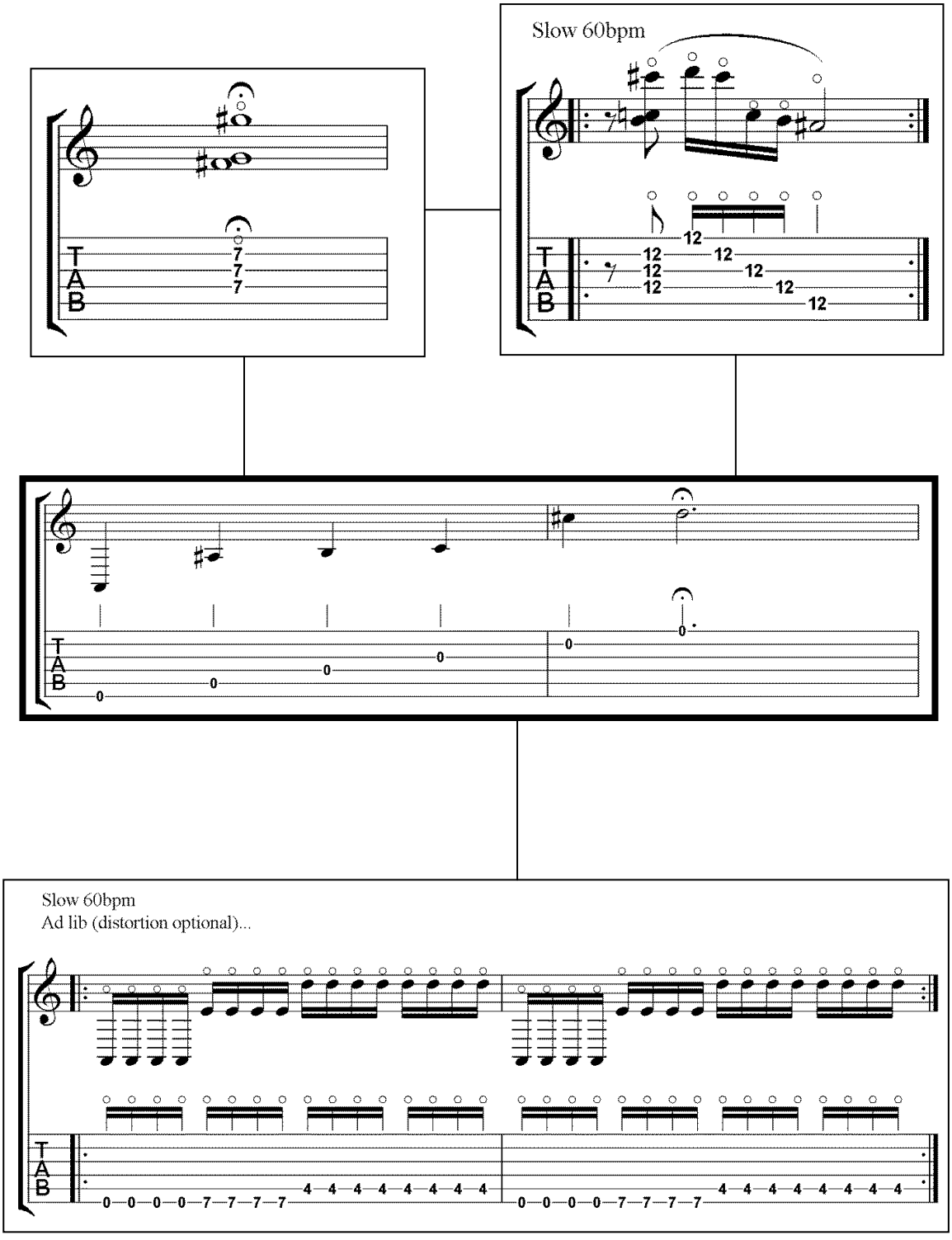
‘Chromatic Attack’ AA#BCC#D Chromatic Tuning

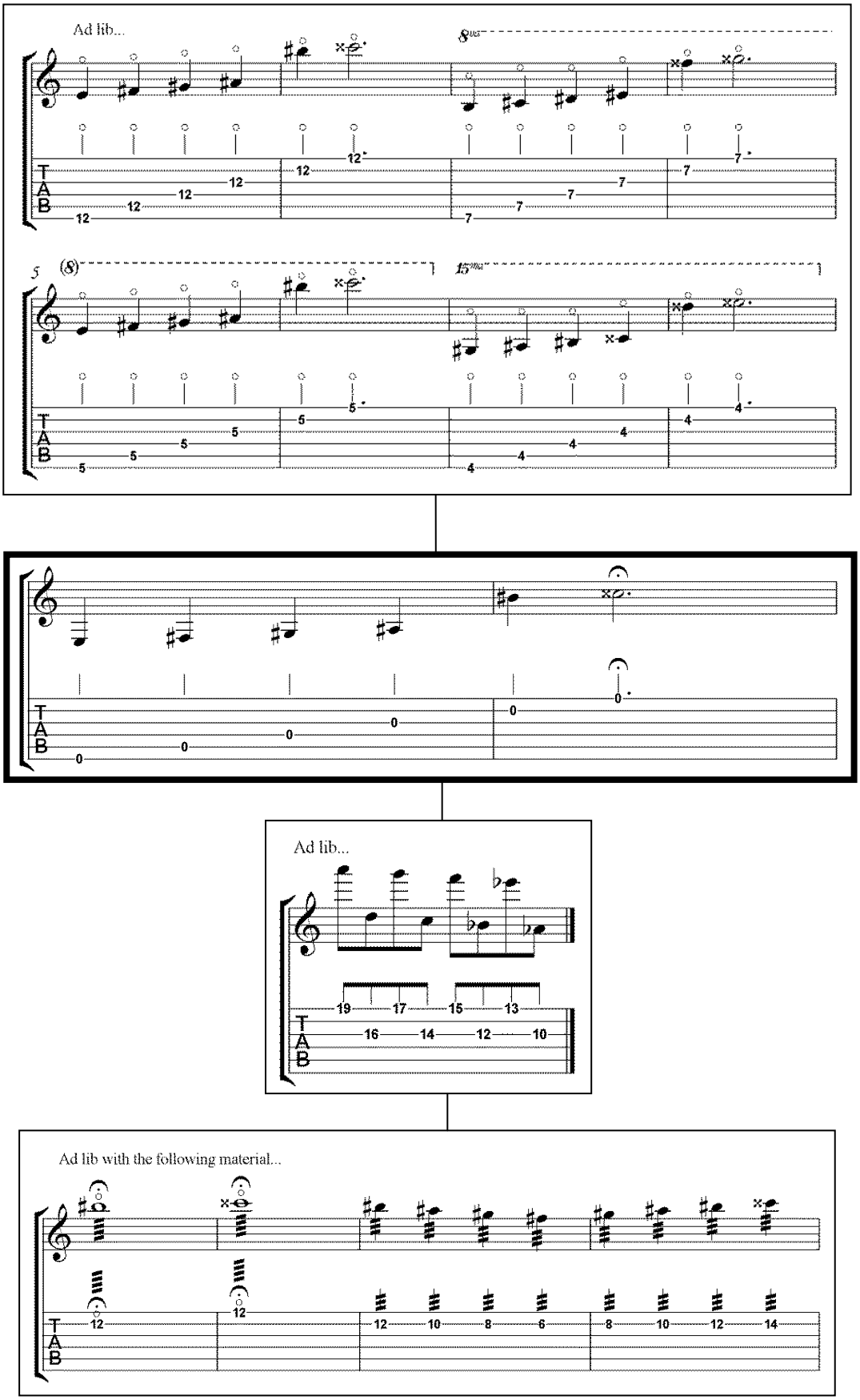


‘Chromatic Attack’ P2

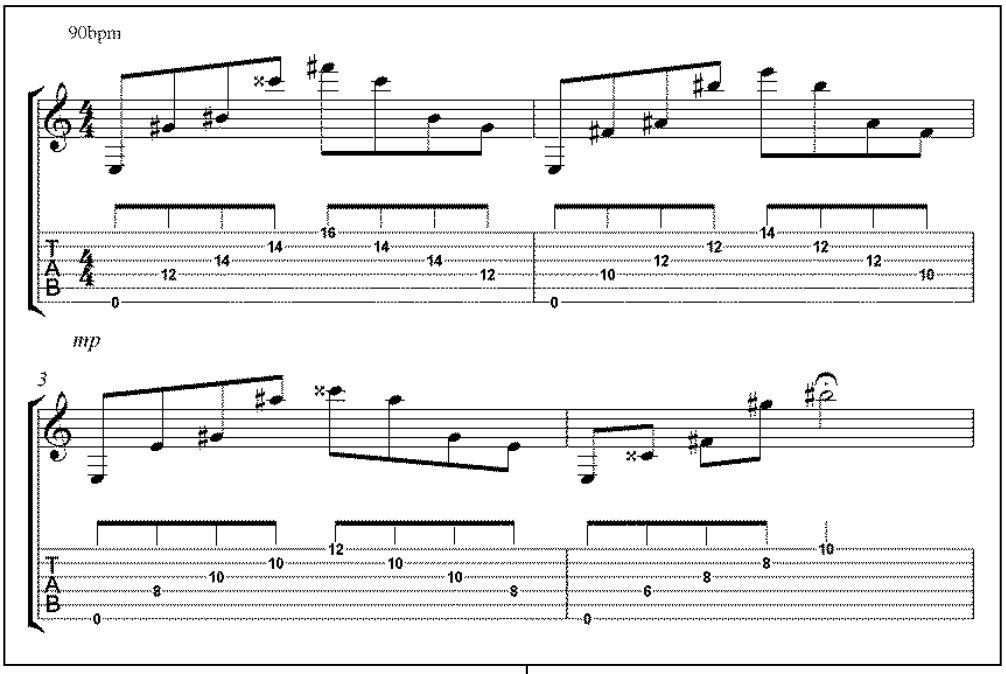


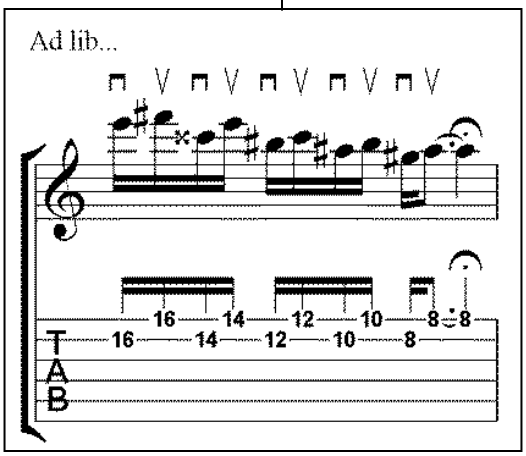
‘Babylon Bells’ AA#BCC#D Chromatic Tuning



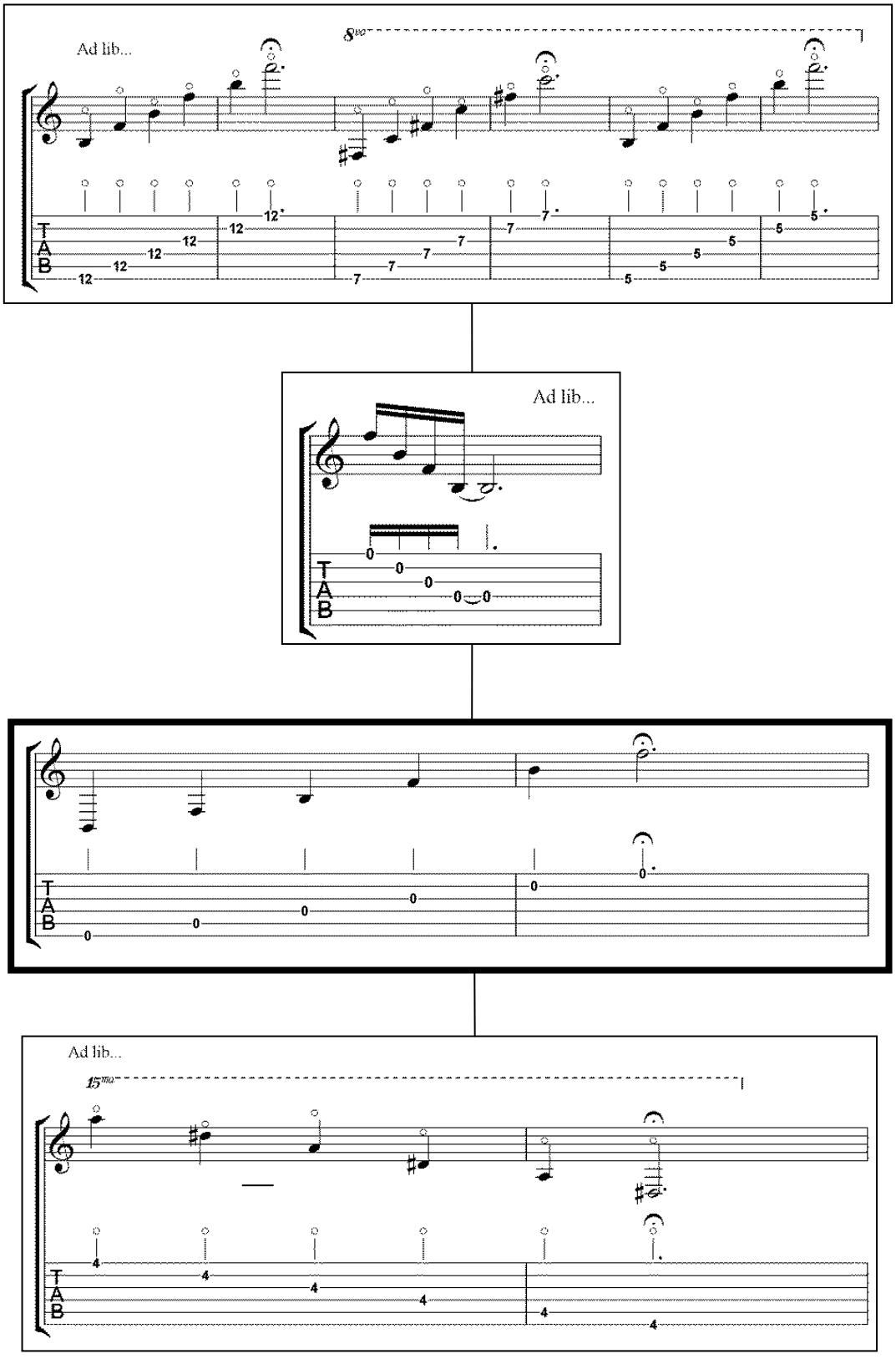

Ad lib...
Ad lib...
Ad lib with the following material...

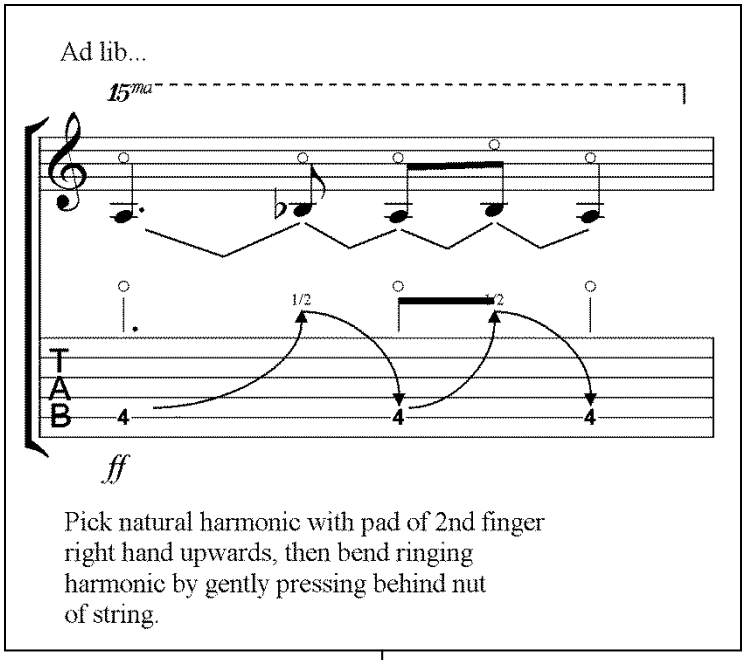
‘Surf-Dale’ P2

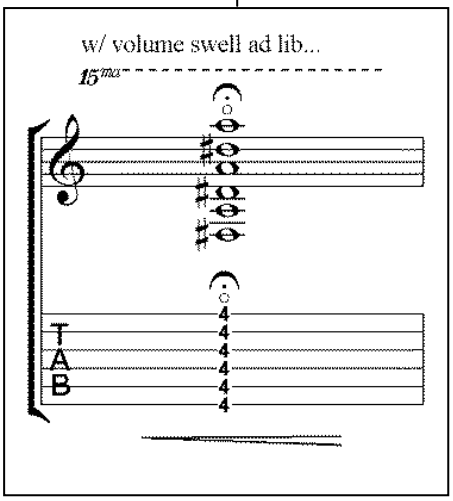




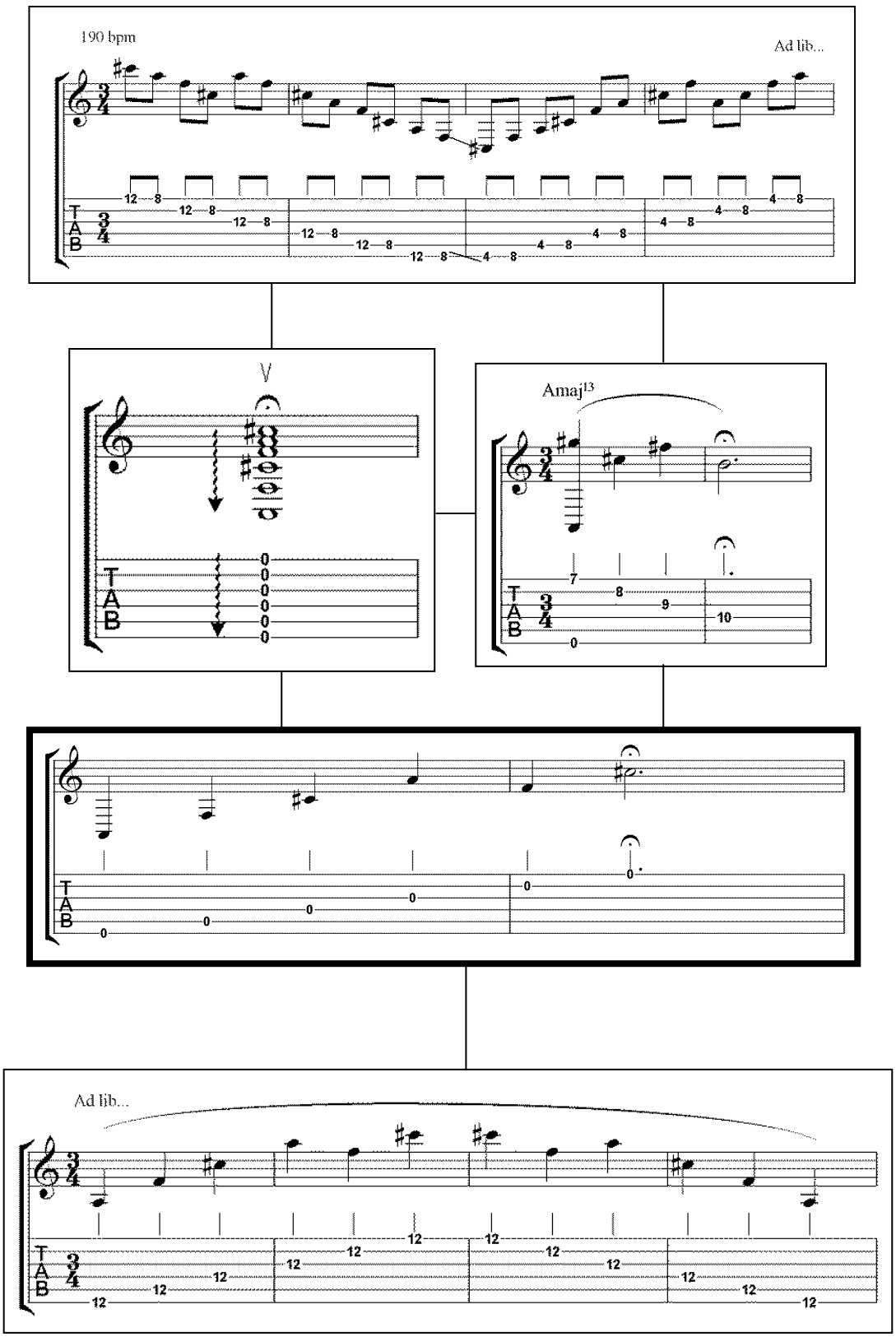
‘KotoFuzz’ BFBFBF Tritone Tuning



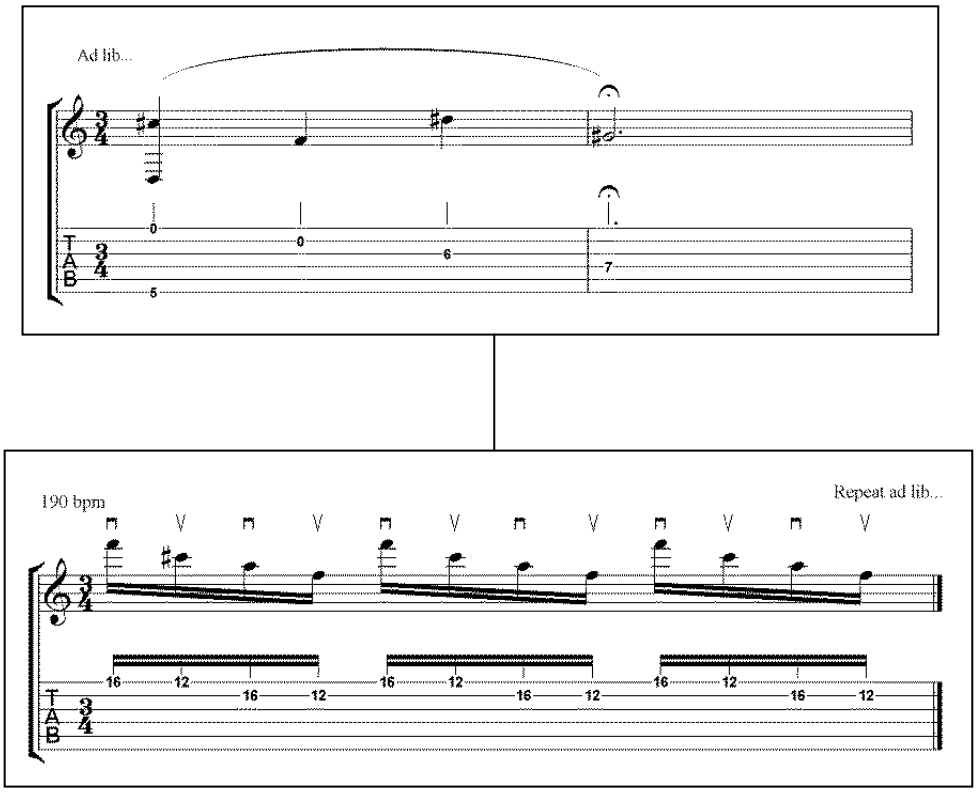

Ad lib...
15ma
1/2
T
A
B
4
4
4
ff
Pick natural harmonic with pad of 2nd finger
right hand upwards, then bend ringing
harmonic by gently pressing behind nut
of string.


w/ volume swell ad lib...
15ma
T
A
B
4
4
4
4
4
4

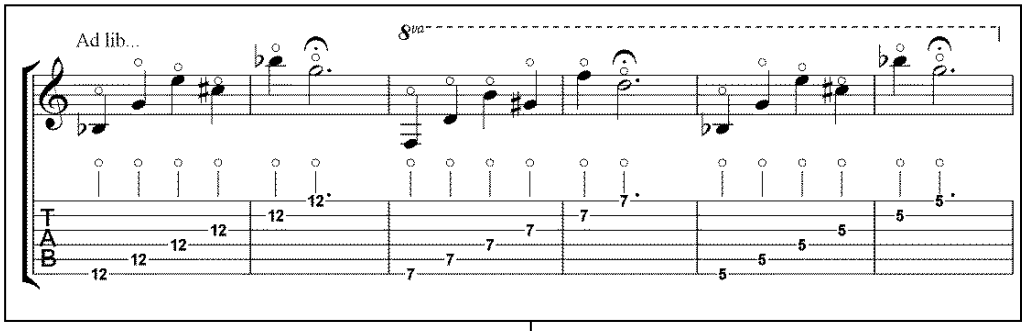
‘Augmented Realism’ AFC#AFC# Regular Minor 6th Tuning

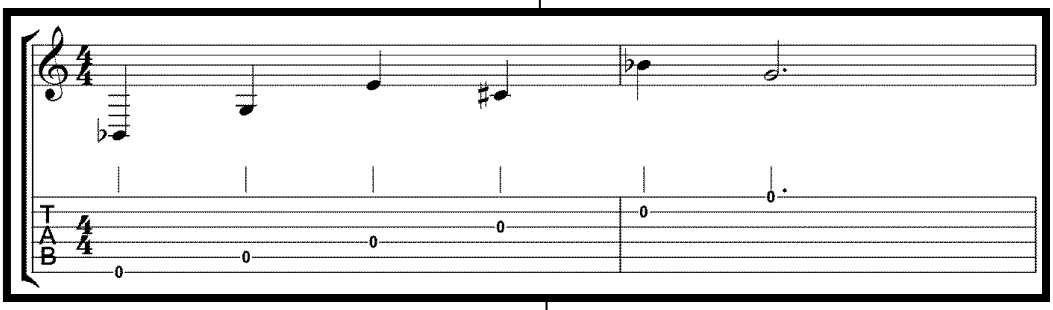


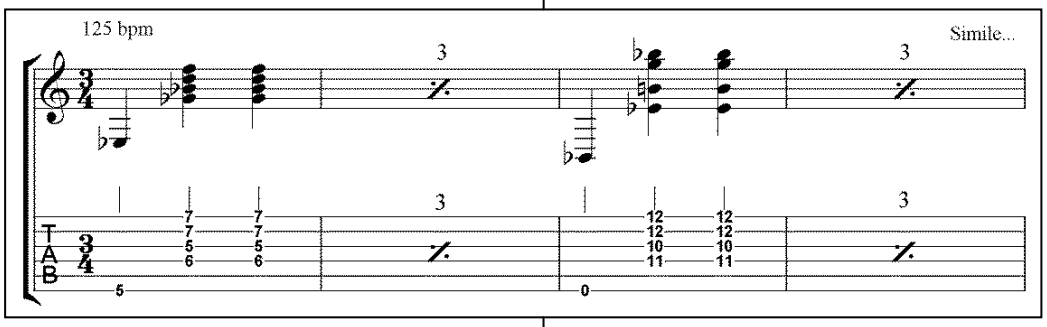
‘Augmented Realism’ P2

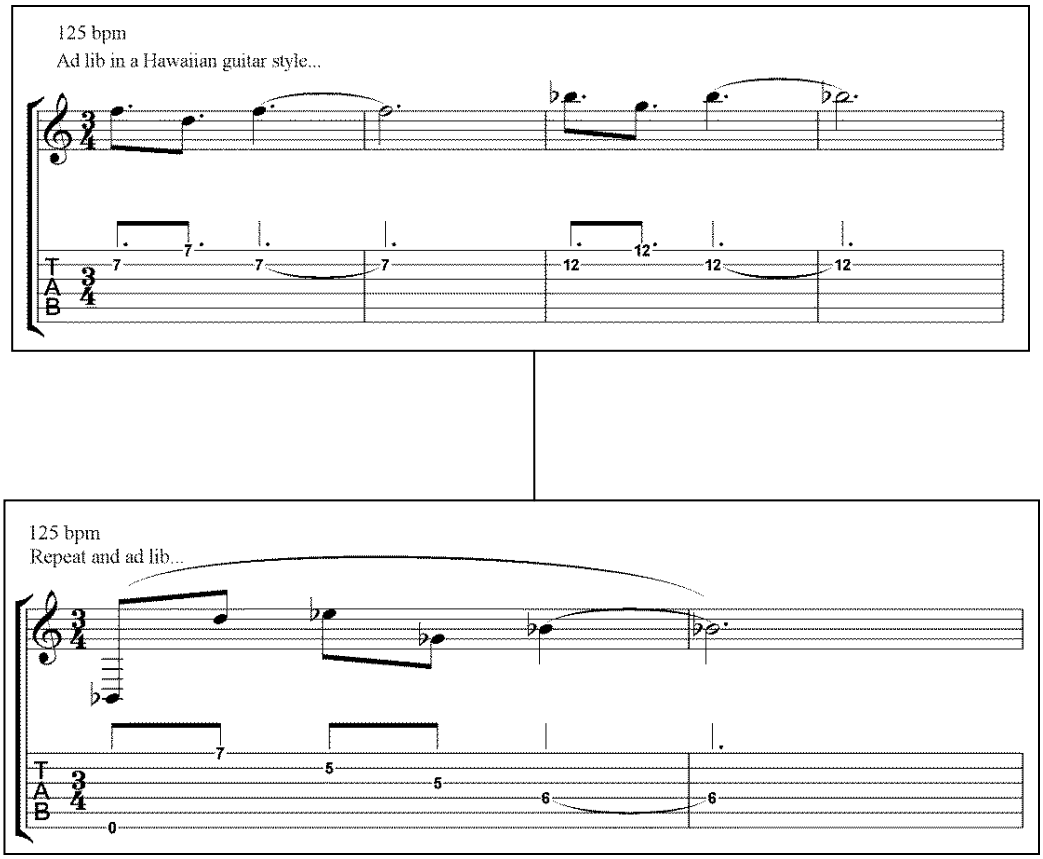


‘Volcanic Waltz’ BbGEC#BbG Regular Major 6th Tuning

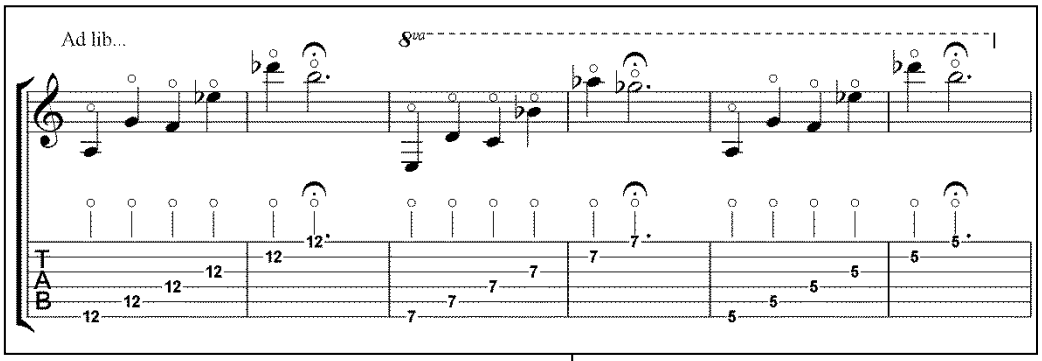


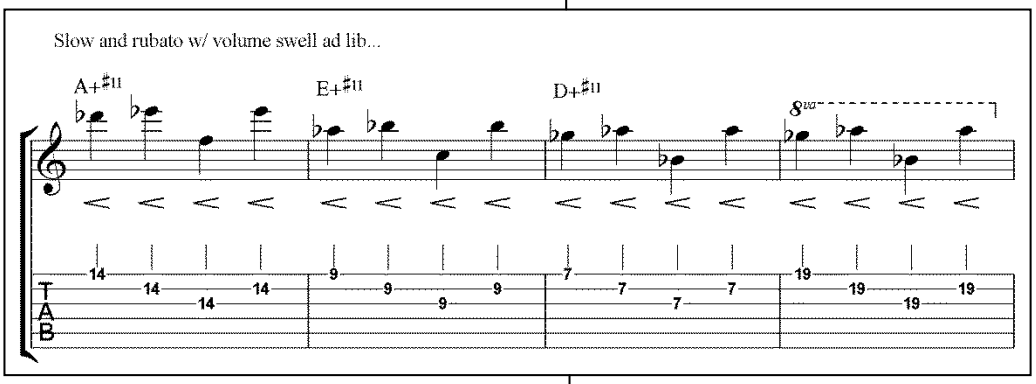


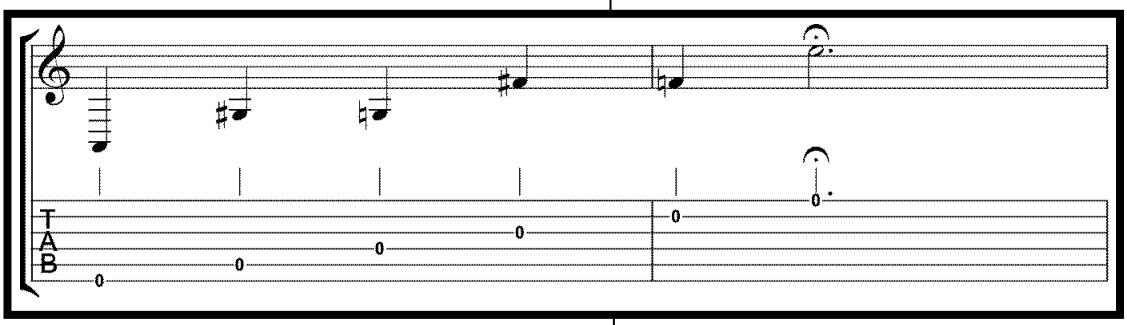


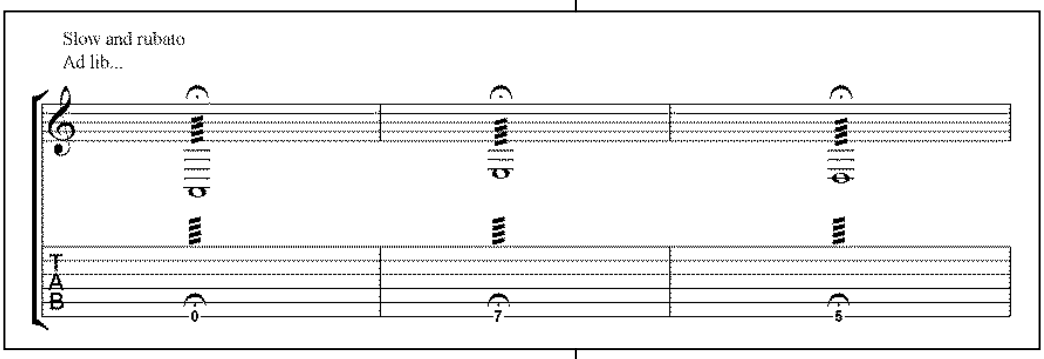

125 bpm
Ad lib in a Hawaiian guitar style...
125 bpm
Repeat and ad lib...

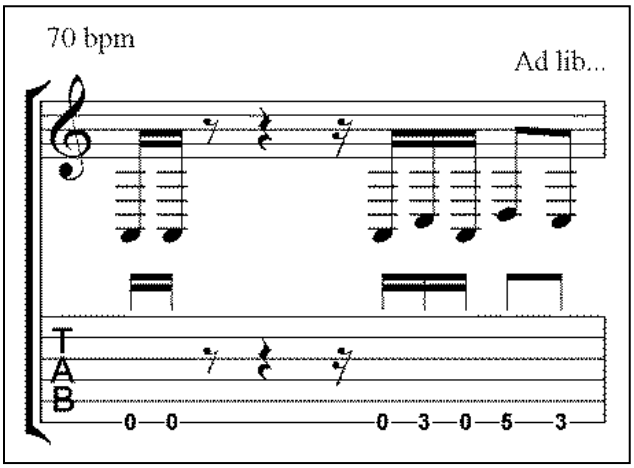
‘All’s Swell, Ends Swell’ AG#GF#FE Regular Major 7th Tuning



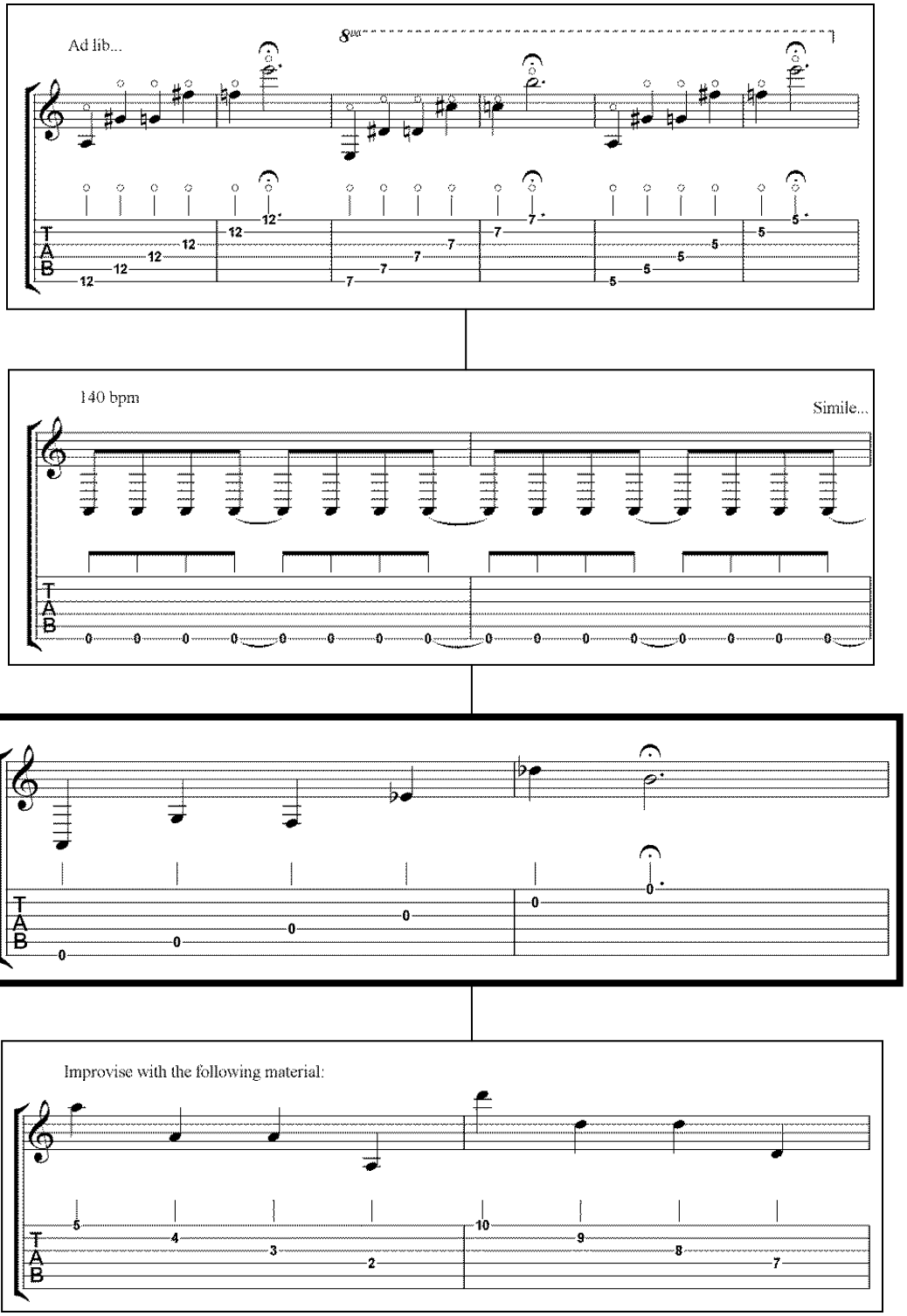


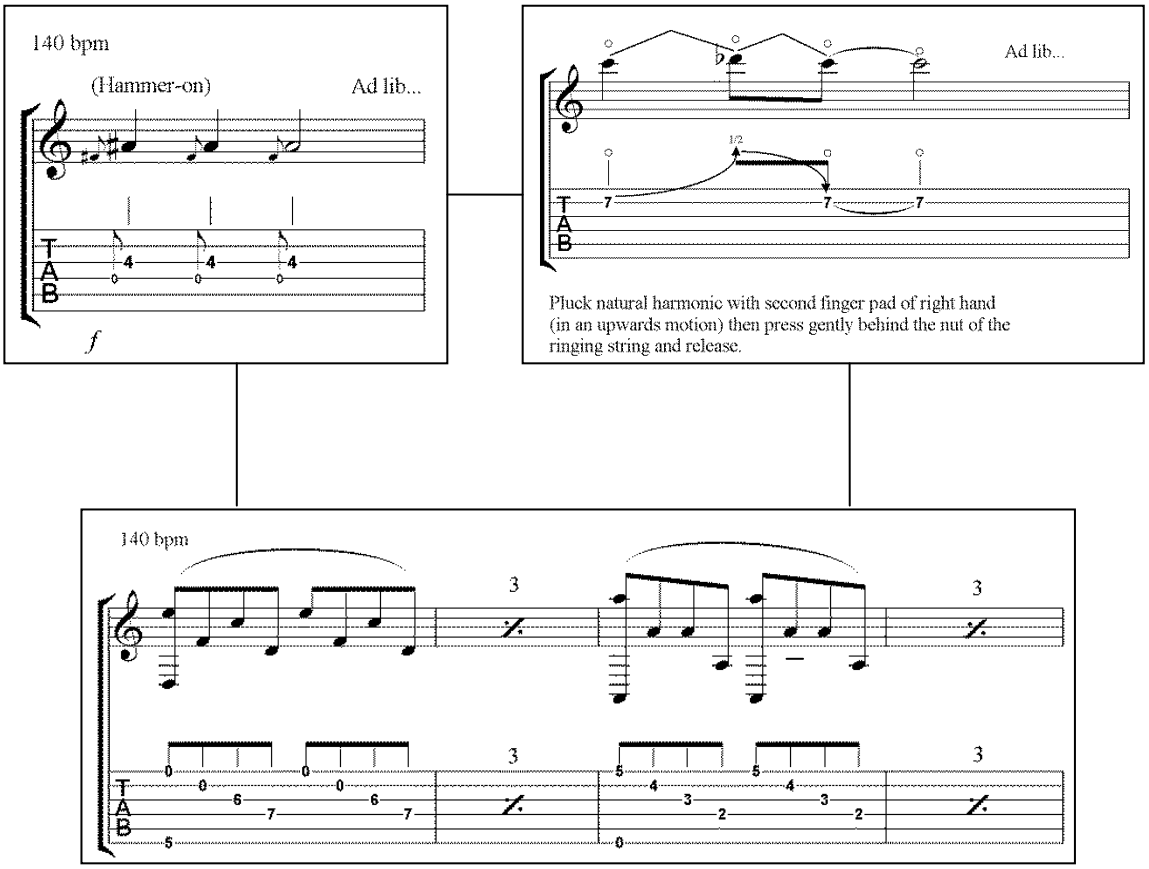




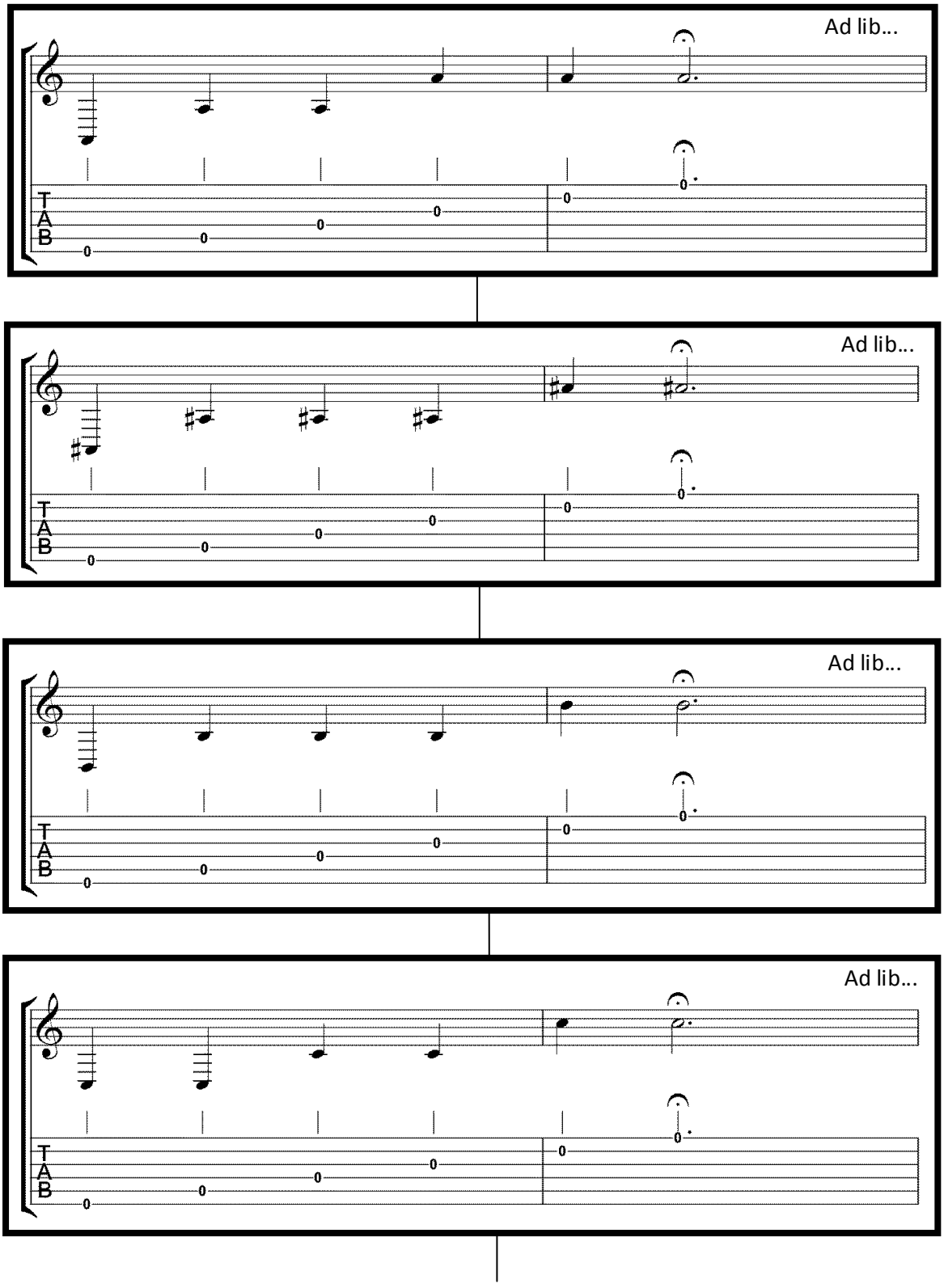

70 bpm
Ad lib...
T
A
B
0 0 0 3 0 5 3

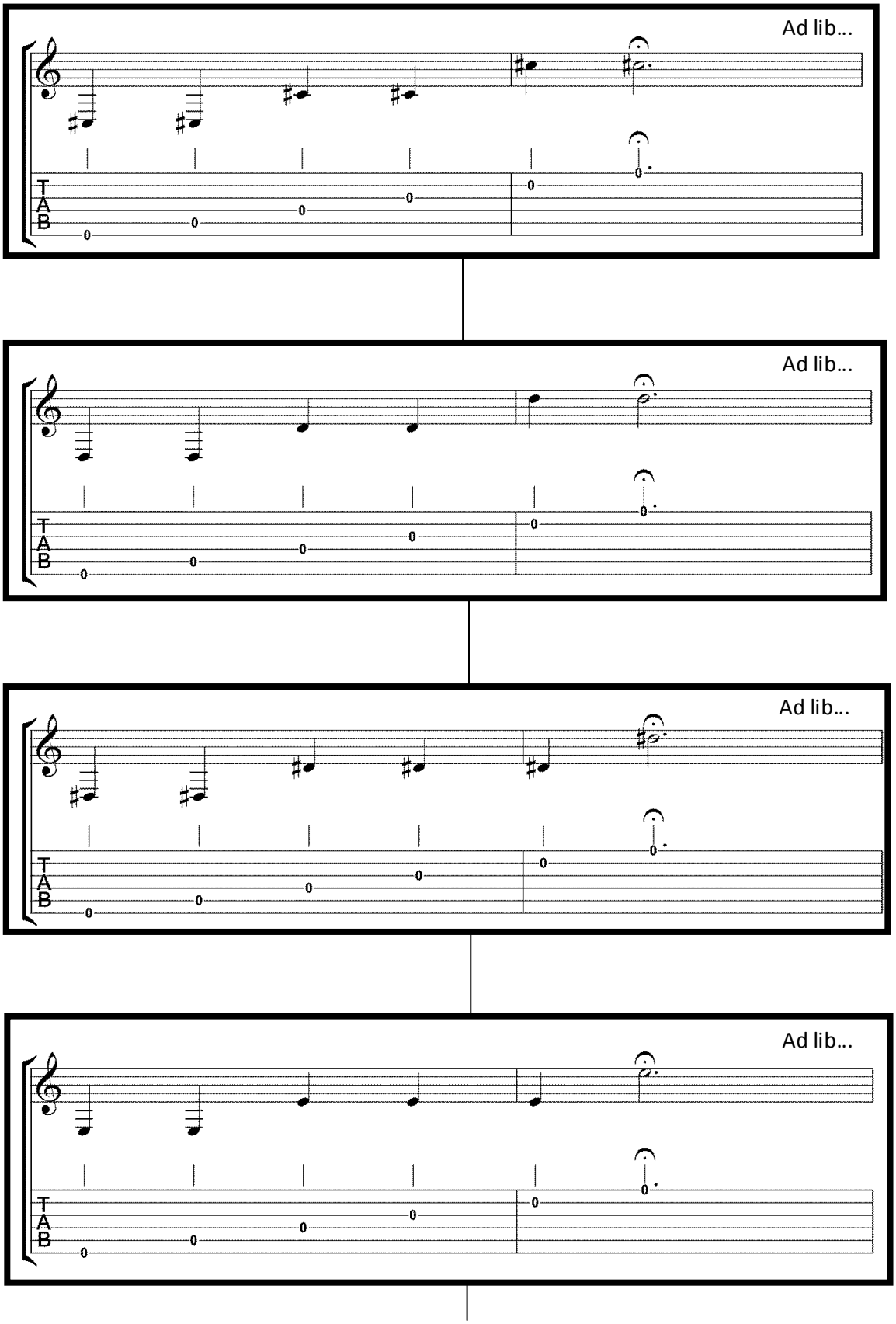
‘Night Train to Mumbai’ AGFEbDbB Regular Minor 7th Tuning

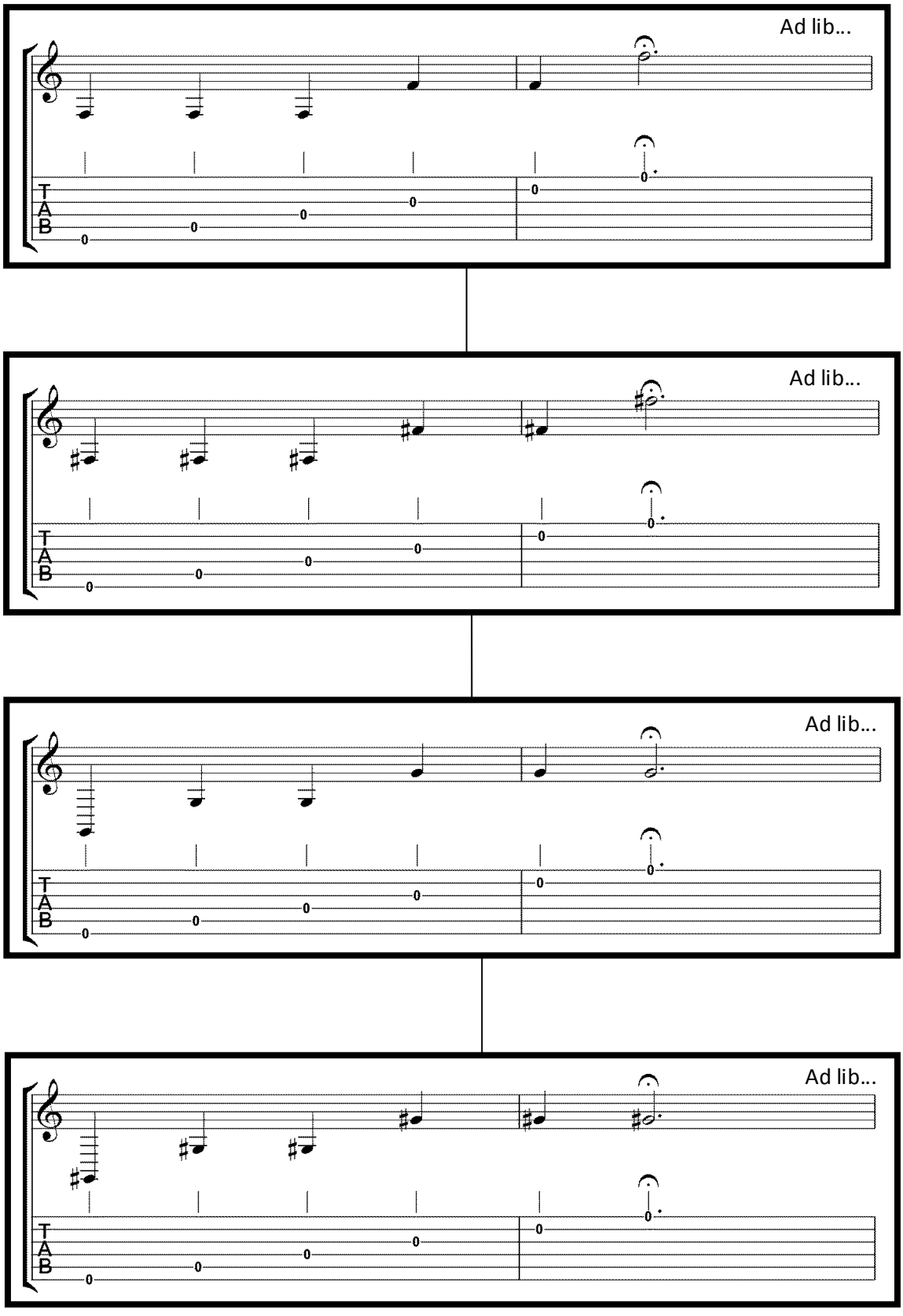



140 bpm
(Hammer-on)
Ad lib...
f
Ad lib...
1/2
Pluck natural harmonic with second finger pad of right hand
(in an upwards motion) then press gently behind the nut of the
ringing string and release.
140 bpm

‘Twelve Constellations’ Unison/Octave Tuning (all 12 keys)




Ad lib…
Ad lib…
Ad lib…
Ad lib…


Ad lib...
Ad lib...
Ad lib...
Ad lib...